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U. S. DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

PROCEEDINGS

OF THE

TWELFTH ANNUAL CONVENTION

OF THE ASSOCIATION OF

American Agricultural Colleges and Experiment Stations

HELD AT

WASHINGTON, D. C., NOVEMBER 15–17, 1898

EDITED BY

A. C. TRUE and W. H. BEAL, for the Office of Experiment Stations

AND

H. H. GOODELL, for the Executive Committee of the Association

WASHINGTON
GOVERNMENT PRINTING OFFICE
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* Director.
† Assistant director in charge.
‡ Acting director.
§ Chairman of council.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
Washington, D. C., March 15, 1899.

SIR: I have the honor to transmit herewith for publication Bulletin No. 65 of this Office, containing the proceedings of the Twelfth Annual Convention of the Association of American Agricultural Colleges and Experiment Stations, held at Washington, D. C., November 15–17, 1898.

Respectfully,

A. C. TRUE,
Director.

Hon. JAMES WILSON,
Secretary of Agriculture.

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Bibliographer:

A. C. TRUE, of Washington, D. C.

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W. M. HAYS, of Minnesota; E. DAVENPORT, of Illinois;
W. P. CUTTER, Librarian U. S. Dept. of Agriculture.

Methods of Teaching Agriculture:

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ALSTON ELLIS, of Colorado; ALEXIS COPE, of Ohio;
M. H. BUCKHAM, of Vermont; J. H. WASHBURN, of Rhode Island.

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W. H. JORDAN, of New York; M. A. SCOVELL, of Kentucky;
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Uniform Fertilizer Laws:

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Military Instruction in Land-Grant Colleges:

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A. W. HARRIS, of Maine; H. H. GOODELL, of Massachusetts;
C. W. DABNEY, of Tennessee; R. H. JESSE, of Missouri;
H. C. WHITE, of Georgia.

LIST OF DELEGATES AND VISITORS IN ATTENDANCE.

Alabama:

Station (Auburn): P. H. Mell, director.

Arkansas:

Station: R. L. Bennett, director.

California:

College: M. E. Jaffa, assistant professor of agriculture.

Colorado:

College: Alston Ellis, president.

Connecticut:

College (Storrs): G. W. Flint, president; A. B. Peebles, professor of chemistry and physics.

Station (Storrs): W. O. Atwater, director.

Station (New Haven): S. W. Johnson, director; E. H. Jenkins, vice director; W. E. Britton, horticulturist; A. L Winton, chemist.

Delaware:

College: George A. Harter, president; W. H. Bishop, professor of agriculture and biology.

Station: G. H. Powell, horticulturist and entomologist.

Florida:

College: W. F. Yocum, president.

Georgia:

College: H. C. White, president.

Station: R. J. Redding, director; J. M. Kimbrough, agriculturist.

Idaho:

College: H. T. French, professor of agriculture.

Illinois:

College: H. S. Grindley, professor of chemistry.

Station: E. Davenport, director; Isaac S. Raymond, trustee.

Indiana:

College: H. A. Huston, professor of chemistry.

Iowa:

College: J. Craig, professor of horticulture.

Station: C. F. Curtiss, director.

Kentucky:

College: J. K. Patterson, president; F. P. Anderson, professor of mechanical engineering.

Station: M. A. Scovell, director.

Louisiana:

College: C. E. Coates, jr., professor of chemistry.

Maine:

College: A. W. Harris, president.

Station: C. D. Woods, director; J. M. Bartlett, chemist.

Maryland:

College: R. W. Silvester, president; S. S. Buckley, professor of veterinary science; W. T. L. Taliaferro, professor of agriculture; H. B. McDonnell, professor of chemistry; R H. Alvey, professor of English and civics; H. Gwinner, professor of mechanics.

Station: H. J. Patterson, director; J. S. Robinson, horticulturist; W. G. Johnson, entomologist; C. O. Townsend, pathologist.

Massachusetts:

College: H. H. Goodell, president; W. P. Brooks, professor of agriculture.

Station: S. T. Maynard, horticulturist.

Institute of Technology: J. M. Crafts, president.

Michigan:

College: J. L. Snyder, president.

Station: R. C. Kedzie, chemist; I. H. Butterfield.

Minnesota:

Station: W. M. Liggett, director; T. L. Hæcker, dairy husbandry.

Mississippi:

College: B. W. Kilgore, professor of chemistry.

Station: W. L. Hutchinson, director.

Missouri:

College: R. H. Jesse, president.

Montana:

Station: S. M. Emery, director.

Nebraska:

College: G. E. MacLean, chancellor; J. M. Hiatt.

Station: R. S. Hiltner, assistant chemist.

Nevada:

College: J. E. Stubbs, president.

New Hampshire:

College: C. S. Murkland, president.

Station: C. M. Weed, entomologist.

New Jersey:

College: B. D. Halsted, professor of botany and horticulture.

Station (State): E. B. Voorhees, director.

Station (College): J. B. Smith, entomologist.

New Mexico:

College: C. T. Jordan, president.

New York:

Station (Geneva): W. H. Jordan, director.

Station (Ithaca): I. P. Roberts, director; M. V. Slingerland, assistant entomologist.

North Carolina:

College: A. Q. Holladay, president.

Station: W. A. Withers, acting director and chemist.

North Dakota:

College: J. H. Worst, president; E. S. Keene, professor of mechanics.

Ohio:

College: J. H. Canfield, president; T. F. Hunt, dean; W. I. Chamberlain and Alexis Cope, board of trustees.

Station: C. E. Thorne, director; J. T. Robinson, board of control.

Oklahoma:

College: R. J. Edwards, board of regents.

Pennsylvania:

College: G. W. Atherton, president; G. C. Watson, professor of agriculture; W. C. Patterson.

Station: H. P. Armsby, director; W. Frear, chemist.

Rhode Island:

College: J. H. Washburn, president; T. C. Rodman, instructor in woodwork.

Station: A. A. Brigham, director; H. J. Wheeler, chemist.

South Carolina:

College: H. S. Hartzog, president.

College for colored: T. E. Miller, president.

Station: J. S. Newman, vice director.

South Dakota:

College: J. W. Heston, president.

Tennessee.

College: C. W. Dabney, president.

Utah:

Station: Luther Foster, director.

Vermont:

College: M. H. Buckham, president.

Station: J. L. Hills, director.

Virginia:

College: J. M. McBryde, president.

Washington:

College: E. A. Bryan, president; O. L. Waller, professor of mathematics and civil engineering.

West Virginia:

College: L. C. Corbett, professor of horticulture.

Station: J. H. Stewart, director; B. H. Hite, chemist.

Wisconsin:

College: O. E. Clark, regent.

Station: F. W. Woll, chemist.

Wyoming:

College: E. E. Smiley, president.

Station: B. C. Buffum, vice director.

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Division of Soils: L. J. Briggs, F. K. Cameron, T. H. Means, F. D. Gardner.

Division of Forestry: C. A. Keffer.

Division of Statistics: John Hyde.

Division of Vegetable Physiology and Pathology: H. J. Webber.

Division of Pomology: Allen Dodge.

Bureau of Animal Industry: H. E. Alvord, R. A. Pearson, E. A. de Schweinitz.

Library: W. P. Cutter.

Visitors:

Mrs. J. H. Canfield, Mrs. J. K. Patterson, Mrs. M. A. Scovell, Mrs. T. C. Rodman, Mrs. Calvin S. Brice, Mrs. J. H. Washburn, Mrs. A. A. Brigham, J. North, J. W. Hoyt, J. A. Myers, W. J. Quick, B. von Herff, J. S. Meng, E. C. E. Lord, T. T. Stewart, J. B. McDonough, David Siebert, C. W. Dorsey.

PROCEEDINGS OF THE ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

MINUTES OF THE GENERAL SESSION.

Morning Session, Tuesday, November 15, 1898.

The convention was called to order at 9.30 a. m. by President H. C. White, of Georgia. Prayer was offered by President M. H. Buckham, of Vermont.

The chairman of the executive committee read the report of that committee, as follows:

Report of the Executive Committee.

To your executive committee were intrusted a number of very important measures vitally affecting the interests of the Association. All these have received careful consideration and such action taken as the circumstances seemed to warrant.

Very early in the year a letter was received from the chairman of the committee on seed testing, appointed at the 1896 convention, stating that he had been unable to be present when the committee made its report in 1897, and that he had sent a letter asking for the continuance of the committee for another year, in order that it might determine practically the values of the apparatus and methods proposed rather than to leave it to the seed dealers. The letter arrived too late for action, and he now asked the executive committee to grant such authority. The matter being an important one and requiring immediate action, your committee, under the fourth article of the section relating to officers, authorized by written vote the continuance of the said committee for another year.

The question of securing necessary legislation for the sale of uniforms, either made up or the cloth for the same, at Government prices, to the cadets of the different colleges, was taken before the Military Committee of the House at its short session. The chairman refused to consider it, on the ground that the appropriations had already been made up and that this would require an extra appropriation for the purchase of extra cloth, and that he was pledged not to ask for any extra appropriations. It was urged that this did not call for any extra expense, as the money resulting from the sales would be covered back into the Treasury. But the chairman refused to recede from his position. Your committee recommend a continuance of effort on the same lines.

At the same time legislation was sought for creating the land-grant colleges depositories of all Government publications. A bill was drafted and introduced into the Committee on Printing. Objection on technical grounds having been made it was withdrawn, and introduced a second time in a modified form. The approaching difficulty with Spain, however, soon absorbed the entire attention of Congress, and it failed to be reported. Your committee has since learned that there are not copies of the public documents sufficient to supply the colleges, and that a second bill, providing for this addition, would be necessary.

Of all the questions submitted for the consideration of your committee no one has caused so much anxiety as that involving the annuity passing under the name of the Morrill fund. The act (Senate 372) providing free homes on the public lands for actual and bona fide settlers by reserving the public lands, 20,000,000 acres, for that purpose, struck immediately at the source from which the Morrill annuity is derived, namely, the proceeds derived from the sale of public lands. The act provides "That all settlers under the homestead laws of the United States upon the public lands acquired prior to the passage of this act by treaty or agreement from the various Indian tribes, or upon military reservations which have been opened to settlement, who have or who shall hereafter reside upon the tract entered in good faith for the period required by existing law, shall be entitled to a patent for the land so entered upon the payment to the local land officers of the usual and customary fees, and no other or further charge of any kind shall be required from such

settler to entitle him to a patent for the land covered by his entry." The act passed the Senate and was in the hands of the House Committee on Indian Affairs, by whom it was favored, before it was discovered or its mischievous effects upon the college revennes realized. Your committee, assisted by others, was promptly on the ground, not once, bnt five or six times, and every effort was made to warn the colleges of the peril. But for the energetic action of their officers duriug the two days of debate upon the bill it must certainly have passed. It was finally rejected, but, the Senate refusing to recede, the following compromise was agreed upon: "That the settlers who purchased with the coudition annexed of actual settlement on all ceded Indian reservations be, and they are hereby, granted an extension to July 1, 1900, in which to make payments as now provided by law." That is, instead of making the settlers a free gift of the land, the Government has extended the time for payment. It is like the case of the creditor who refuses to cancel his debtor's note, but gives him easier terms as to installments. There is, however, this difference, that the Government does not call for any iustallment. Do not deceive yourselves, gentlemen of the Association; sooner or later this question will again confront yon, and it is the part of wisdom to settle upon our future policy. While the bill was being debated in the House, Senator Morrill introduced a measure into the Senate providing that the college aunnities should be paid from any unappropriated sums in the Treasury. This bill passed through two readings and was then lost sight of in the greater interests of the war. It is the unanimous opinion of your committee that either that bill or one of similar import should be passed.

In response to the many requests for information respecting the detail of officers to the colleges, a personal interview with the Adjutant-General of the Army was secured, and the order of the War Department forbidding the detail of any officer for any service until after the report of the peace commissioners was sent out in circular letter to each presiding officer. While it would seem impossible at present to secure any details, would it not be for the best interests of this Association to place itself on record, either now or at such time as may seem suitable, respectiug the value of these details to the colleges and the country at large? The law distinctly states that in the details to the several States prefereuce is to be given to the colleges of agriculture and mechanic arts. It further states that officers must be detailed who are agreeable to the anthorities of the different institutions. Both these provisions have been disregarded in two or three instances. It is recommended that when action is taken the whole subject of these details be carefully reviewed and colleges receiving officers on their faculty as one of their uumber be allowed a choice in this matter.

The order of the President during the late war allowing a certain number of second lieutenants to be appointed from the colleges did not entirely secure the result intended. Consultation was not had with the college authorities. Selection was made from the ranking men in the military department, and when, as happened in three cases, the men were unable to accept from physical disability or other cause, the colleges were passed by. The subject has seemed of sufficient importance to have a special paper presented to this convention on "Land grant and other colleges and the national defense."

Special committees having been appointed to forward the interests of the cooperative station exhibit at Paris in 1900, the establishment of experiment stations of engineering and the securing facilities for graduate work in the several Departments at Washington, reports will be made by their respective chairmeu, and we will not occupy your time with what would be mere repetition.

In conclnsion, we would state that the usual duties devolving upon the committee have been faithfully performed. The proceedings of the last conveution have been edited and published, the various papers recommended by the committee appointed for that purpose have been published, and the customary notices, programs, etc., have been issued.

In behalf of the executive committee.

HENRY H. GOODELL, *Chairman.*

The report of the treasurer was submitted. The followiug is a summary of the report:

REPORT OF THE TREASURER OF THE ASSOCIATION, JULY 12, 1897, TO NOVEMBER 11, 1898.

Amonut on haud July 12, 1897	$423.75
Amonnt received from dues	1,040.00
Total	1,463.75
Amonnt paid for bills on approval of chairman of the executive committee.	907.71
Balance	556.04

The Chair appointed an auditing committee, consisting of R. W. Silvester, of Maryland; M. E. Jaffa, of California, and J. L. Hills, of Vermont, which later made the following report, which was accepted:

The committee appointed to audit accounts of the Association has performed the duty assigned. It has found the accounts correct and therefore approved the same.

R. W. Silvester,
M. E. Jaffa,
J. L. Hills,
Committee.

As chairman of the Section on College Work, A. Ellis, of Colorado, read the following paper, setting forth his views on the work of the land-grant colleges:

Some General Considerations Regarding the Work of Agricultural Colleges.

The college year that closed last summer left abundant evidence of the increased usefulness of the land-grant colleges. If the statements to be found in the catalognes and reports of the institutions of learning here represented are to be credited, there is cause for congratulation in the present condition of all phases of education made operative by the working out, to useful ends, of the various provisions of the Morrill bills.

For this brief report I have not secured material by correspondence, nor have I made serions delvings into catalogue and report literature in order herein to present information with which most of you are already familiar. Responsibility for the statements and suggestions that make up the main body of this report should rest upon the writer, not upon the section for which, perhaps, a misdirected choice has made him spokesman.

The institutions known to us as "land-grant colleges" are the most elaborately reported of all the educational agencies of the country. Those of our people who have not some pretty clearly defined knowledge of their workings and aims are without such knowledge from choice rather than necessity. Some of the bulletins issued from the United States Department of Agriculture are freighted with valuable information regarding the practical workings of the land-grant colleges and the experiment stations connected with them. The association before which this report is presented is, in my opinion, the best organized educational body in the United States. It is not an educational mass meeting, but a delegate body of limited membership, representing in its make-up some of the best educational thought and effort of the day. At the eleventh annual convention, held in Minneapolis in the summer of 1897, 36 States and 2 Territories were represented by duly accredited delegates. Its executive committee has been an active and important factor in keeping alive and strengthening a feeling of community of interests among our college authorities. Experience has taught us confidently to look to it for speedy and trustworthy information of proposed measures inimical to our welfare and for well-considered, practical suggestions as to the best mode of defeating them.

Functions of the Land-Grant College.

It would seem, at first view, that there ought to be no difficulty in rightly interpreting the provisions of the Congressional acts of 1862 and 1890. The first includes eight sections and the second five. Both acts, in full, would not cover more than three pages, in size and type similar to those to be found in the published proceedings of our last convention. Look at the names of the institutions that are beneficiaries under said acts, and the conviction is forced upon you that those who control them are far from having a common understanding of the amount and character of the educational work for the promotion of which the Morrill bills were framed. The author of those measures has been called upon time and again for an expression of his purpose in their preparation. He has uniformly asserted that the acts were designed to meet the educational requirements of the millions engaged in industrial pursuits. He has affirmed that the term "agricultural college," as applied to the institutions established under the acts of Congress before referred to, is a misnomer and not suggestive of the liberal education of the industrial classes.

The name "college of agriculture and mechanic arts" comes nearer to expressing the purpose of the Morrill bills, as far as that purpose can be determined from their wording, than does the term to which Senator Morrill so strongly objects. There are some points that, to me, seem clearly established. Congressional legislation never contemplated any general duplication of existing institutions. No one can

find in any part of the Morrill bills any authority for the establishment and support of schools exclusively for agriculture or the mechanic arts. No narrow, one-sided, technical school is authorized anywhere in the bills to which reference has been made. The teaching of trades, the forcing to farm labor, and the neglect of the cultural in education can find no authorization in the broad and liberal provisions of these enlightened measures.

It is unfortunate in many ways that the name "agricultural college" has been fastened upon so many of the institutions we represent. It may be doubted whether the appellation "land-grant college" suggests anything of the nature of the educational work with which we are familiar. As long as our institutions are called agricultural colleges, agricultural and mechanical colleges, industrial universities, and names equally significant, we may expect the general public to have erroneous ideas of their legitimate work and aims. What more natural than to expect and require an agricultural school to teach agriculture and but little else? If an industrial university is not to teach all the trades—prepare for all the vocations in which physical energy is employed—we are led to say, "What's in a name?" The people with whom we have to deal are not wholly to blame for the persistence with which they hold to the opinion that our mission in the educational world is to give that practical training that will best fit one to become a farmer or a mechanic. In many cases we have appealed to our lawmaking bodies for financial support with arguments tending rather to strengthen than to weaken this narrow and illiberal view.

The common opinion of what a college founded "for the benefit of agriculture and the mechanic arts" should do is expressed in the questions that reach us from some self-named practical man who professes to believe that the less education one has the better fitted he is for labor on the farm or in the shop.

The head of a so-called agricultural college is asked how many farmers' sons seek his institution for educational advantages and how many of these, after a period of college training, return to the farm. A few quotations from a reply I once wrote to a series of such questions may find an appropriate place in this connection:

"The writer of the queries forgets, seemingly, as many others forget, that the land-grant institutions are not exclusively agricultural schools, although some of them are operated under the title, 'agricultural college.' It is well to keep in mind the scope of the Congressional act of 1862, under whose wise and liberal provisions more than sixty scientific and technical schools, 'to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life,' have been established.

"In no part of the various provisions found in the Congressional acts of 1862 and 1890, better known as the 'Morrill bills,' can the word 'agriculture' be found out of immediate connection with the term 'mechanic arts.' The just conclusion is that the so-called land-grant college is as much an institution for promoting education in the mechanic arts as in agriculture. A clear understanding of this fact will weaken the force of much criticism upon the work and the products thereof of the land-grant colleges. All these institutions of learning—they are such; not merely little, narrow, one-sided schools of agriculture resting upon a shallow scientific foundation—have, or ought to have, under the requirements of the Congressional acts, courses of study making adequate provision for instruction in 'agriculture and the mechanic arts' and such branches of learning, including the classics, as are related thereto, and properly suggesting a 'liberal and practical education.'

"I have not a wide range of statistics at hand to support my opinion that the work of the agricultural college is becoming a strong force to popularize and make more remunerative all phases of labor connected with farm life.

"There are strong influences tending to counteract this good work, and these influences are thrust through college doors into college halls by farmers themselves. Only yesterday a farmer of more than average thrift and intelligence brought his 17-year-old boy to my office to arrange for his admission to college. In the boy's presence he stated that his purpose to have him enjoy the advantages of the institution was born of a desire to have him get a living by some easier, surer, and swifter process than farming. Are there not many such farmers in the land? I venture to say that the larger number of farm people who send their sons and daughters to the agricultural colleges do so in the hope of freeing them from the necessity of the slave life of labor, as they call it, through which they passed to the creature comforts they now enjoy. These comforts are too plain, too everyday, and too little suggestive of social dissipation to satisfy wants that have grown abnormal under the promptings of the restless, uneasy, dissatisfied spirit all too common among our people. Then, too, people want to get rich fast and are not always choice as to methods. No wonder that under such home influence the boy grows into the belief that an education worth having should bring its owner the maximum of pay with a minimum of effort.

"The college in which science is taught practically, where technical work is wisely planned and made an everyday exercise, is doing more to make toil respected than

the farm home presided over by parents who teach their children to look upon an education as the 'open sesame' to a life in which the work grows lighter as the pay becomes greater.

"Even the graduate from the agricultural course of a college is not always to be blamed for not throwing himself with spirit into the usual current of farm life. There may be no farm to which he can profitably return. That of his father, it may be, is under full tribute to support the stay-at-homes. The son with a college training, costing some years of effort and a snug sum of money, naturally rebels against entering into the labor and compensation of the average farm hand of the push-and-pull, fetch-and-carry order. If the possessor of a college diploma can direct, with advantage to all concerned, the operations of an extensive irrigating system, why ask him to pull on a pair of irrigating boots and irrigate the crops on some landowner's farm at $25 per month and board? If an education fits one to earn $100 per month, why find cause for criticism because he is unwilling to engage in a more uncongenial labor for much less pay? What kind of service from the agricultural college graduate is it reasonable to demand? The one capable of directing aright the labor energy of a number of employees, in any branch of industry, is giving better service than he could render under the condition of the average laborer.

"It is too soon to declare without qualification the success or failure of the agricultural college in industrial fields, be they urban or rural. Some of the operations of this new educational agency are in a tentative state, and further data are needed before safe conclusions are reached. I believe it is true that most educational agencies outside of the land-grant colleges and technical schools have little thought about the farmer and the needs of his children as the farm people of the future. The traditions of the old-time college, with its classical course and exaggerated ideas of the value of a professional life, are against any mode of securing a livelihood outside of an office. There is hope for better things under the new educational régime, which recognizes the dignity of manual labor, and professes to fit for it by special scientific and technical training. The educated man is always best equipped to meet the problems of life."

I have already expressed my belief that the institutions established under the provisions of the Morrill bills should form a distinct link in the educational chain. The author of the law of 1862 has said that when he introduced that measure into Congress the colleges and universities of the country were giving an education designed exclusively for the so-called learned professions, with nothing to meet the pressing requirements of the members of the great working bodies of the people. Then in the framing of the law, with which his name is so honorably connected, he could not have contemplated an addition in kind and method to the very institutions he felt had ignored the educational needs of the industrial classes. The Morrill bill of 1862 was not designed so much to strengthen any existing educational institution as to found and provide an endowment for a wholly new one—one that in its work and aims should pretty clearly differentiate itself from colleges and universities as they then existed. It may be admitted that there is argument for teaching almost anything to be found in the latter portion of section 4 of the act of 1862. It is hard to believe, however, that the founding of a new college or university along the then established lines, or the financial strengthening of some institution for higher education that had "given little or nothing to the requirements of the millions engaged in industrial pursuits," was the motive that prompted Congress to pass that law. The trouble is we interpret the educational clause of that measure to support our own views or to defend the environments wherein our professional efforts are exerted.

When the first Morrill bill became operative there was hardly a State college or university in the country that did not make effort to secure recognition under its provisions. The fact that such institution by reason of its lines of study and deep-seated traditions was almost wholly unprepared for the new work and out of all vital sympathy with it was no hindrance to effort on the part of its authorities to secure its further endowment at the expense of the fund established for the "liberal education of the industrial classes."

It is worthy of note that the word university nowhere appears in either of the Morrill bills. Wherever the institution to be established or further endowed is referred to it is termed a college. We recognize a clear-cut distinction between the terms, as did, doubtless, the author of those measures and others who supported them. Plainly, in my view, the Morrill bills were designed to establish and endow new institutions whose aims, methods, and activities should be a wide departure from those then in vogue in the colleges and universities of the land. The new institutions in their work were to keep prominently in view instruction that would further the advancement of agriculture and the mechanic arts. Other scientific and classical studies not closely connected with the main end to be advanced were not necessarily to be excluded from their courses of study, for with all the special training for definite ends held of first value the liberal culture of the students was considered desirable. That some associate anything designated liberal culture with

the study and mastery of the classics—Greek and Latin—is a fact that has no vital connection with the question now under consideration. There are some who are just as pronouncedly of the opinion that all we call culture in the realms of mind and morals is not reached by winding through the intricacies of Latin construction and delving into the mysteries of Greek roots. Even some of the abstractions and mystifications connected with the study of what is rather indefinitely called philosophy might be omitted from the course of the land-grant college without serious loss to the culture and training of its students.

However wide and liberal, in the interpretation of some, may be the provisions of the first Morrill bill, there is no mistaking the fact that pretty definite metes and bounds are set to the educational work of the land-grant college by the terms of the second. Herein it is expressly stated that the more complete endowment and support of the college for the benefit of agriculture and the mechanic arts shall "be applied only to instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural, and economic science, with special reference to the industries of life." Evidently the thought connected with this language is that a liberal education for the man of affairs has some connection with close, student contact with the lines of study thus specifically stated. Did the period that spanned the dates 1862 and 1890 bring a revolution of opinion as to the work proper for a land-grant college to enter upon, or are we to regard the later expression of the will of the law-making power but as an interpretation of what went before?

There is a link that binds these two dates and the provisions of the Congressional acts connected with them. The act of 1887, known as the Hatch Act, connects a department to be known as an agricultural experiment station, with each land-grant college, then established as the result of former legislation, under certain minor conditions that State legislative power may impose. The evident intent of the Hatch Act is to give stronger and more practical impulse to the agricultural work of the land-grant college.

As a result of some of the facts recited—in view of all the legislation of Congress bearing upon the establishment and support of colleges for the "benefit of agriculture and the mechanic arts"—a few conclusions seem warranted:

(1) The State that has established one college for the benefit of agriculture, etc., and that wholly disconnected with any other educational institution, has followed closely in the path marked out by Congressional legislation.

(2) The course of that college, if it make prominent instruction in agriculture and the mechanic arts, is in prime accord with one of the most important provisions in each Morrill bill. To profess to teach branches related to agriculture without teaching the subject itself is, to me, sheer nonsense.

(3) Although special prominence should be given to the subjects before named, other studies designed to broaden and discipline the mind of the student—to fit him for intelligent helpfulness in affairs of society and state—should find a place in the course of study offered by such college. These studies should be such, in the main, as articulate most closely with those already named, and engender a trend of thought and effort most in harmony with the ideas underlying the promotion of industrial education generally.

(4) A course in domestic science, one for a business department, and undergraduate and post-graduate courses in engineering—civil, mechanical, and electrical—are not out of place in the exercises scheduled for the college.

(5) The work of a school of mines has no intimate connection with that of such a college as has been referred to, but inasmuch as its general aim is to make more effective an important phase, in certain sections of the country, of industrial life, its incorporation with that of the land-grant college would not be at variance with the general purport of existing legislation and, in a State where mining is one of the leading occupations of the people, might be strongly in the interest of economy.

(6) Instruction in military tactics is a part of the prescribed work of the institution receiving financial support from the General Government. The land-grant colleges are first served in the authorized details of officers from the Army and Navy to serve as professors of military science and tactics in educational institutions. The requirement is recognized by all the colleges affected; but there are different ways of rendering such requirement effective. The letter and spirit of the law ought to be obeyed, and all able-bodied male students should be held rigorously to a reasonable amount of military service.

STATE AND COLLEGE.

The relation of the State to the land-grant college has not been a subject of much discussion in circles touching the work of the institution. The work of the college will depend almost wholly upon the manner of its organization under State authority and the local interpretation of the provisions of the Morrill bills.

The financial provisions of the original act have given some land-grant colleges a permanent endowment from which they now receive a large annual revenue; others derive but a slender revenue from that act. State equality in sharing in the endowment fund created by the act of 1862 was not secured by reason of the fact that the amount of land apportioned to each State was determined by the number of Representatives in Congress to which it was entitled. This worked to the disadvantage of the newer and smaller States. All States are put upon an equal footing as to Government financial support by the conditions of the act of 1890. No discrimination against a small State is seen in the apportionment of the fund for the support of the experiment stations.

Uniformity in nature and scope of the work of the land-grant colleges is impossible so long as the various State and Territorial governments place their own interpretation upon the language of the Congressional acts. One State begins with an agricultural and mechanical college, and later on converts it into a State university, with courses of study in conformity with the new title. Another finds a full compliance with the acts of Congress in creating a college of agriculture in connection with some existing institution. Some provide one course of study; others a number of courses. Money for the support of all this varied work is taken from both Government college funds, save that language instruction other than English is not paid for from any appropriation authorized by the act of 1890. In many States the appropriation from the State treasury for college support exceeds that received by the institution from the United States Treasury. The State in such cases, at least, can justly claim a controlling voice in the managerial policy of the institution within its borders. Then it must not be forgotten that the purpose of the Morrill bills is not unduly to influence action favorable to the development of certain phases of higher education thought desirable and serviceable within the States. No State is forced to accept the bounty of the Government whereby the better education of the industrial classes is sought to be conserved. The people of this country have been taught by the logic of events to look with disfavor upon any governmental policy smacking strongly of paternalism.

The authorities who have the general supervision, in the name of the Government, of the funds set apart for the maintenance of the sixty institutions, or more, founded under the acts herein so frequently named have ever shown a disposition to recognize State control over them as final to the fullest extent consistent with a very liberal interpretation of the law. Commissioner Harris, of the Bureau of Education, states the guiding principle governing the acts of the officials referred to when he says, "This office has no desire to go behind the returns; and, except where it is evident that a misstatement has been made, the reports of the treasurers are accepted as rendered."

When certain lines of study are specified in the act of 1862, it is at once added that the instruction shall be given "in such manner as the legislatures of the States may respectively prescribe." It is taken for granted that each State will use its own legislative judgment in the matter of founding the college and organizing its work. The action of the legislature of Colorado, in making acceptance of the terms of the act of 1862, in the name of the State, is, I believe, a type of what is best in this class of legislation. A portion of an act approved January 27, 1879, reads as follows:

"Whereas the State of Colorado has constructed and provided for the support and maintenance of an agricultural college within its limits * * * that in conformity with an act of Congress of the United States * * * assent is hereby given to the provisions of said acts and amendments thereto, and the grants mentioned in said act are accepted, with all provisions connected therewith."

After the passage by Congress of the act of 1890, legislative action in Colorado, making full and complete acceptance of its conditions, was coupled with the following authorization: "That the State board of agriculture shall have the control of the fund appropriated by the said act of Congress, and shall disburse the same for the use and benefit of the State agricultural college, in accordance with the terms and provisions of said act of Congress."

These acceptances did not terminate legislative action relating to the management and support of the college. A tax of one-fifth mill on the assessed valuation of property within the State was authorized, special appropriations for buildings were voted, and laws creating a governing board and, in general, defining its duties were enacted. In referring to Colorado, in these particulars, I am calling attention to no isolated case. There is not a State in the Union that would not maintain its right to legislate, almost without restriction, upon matters connected with its college "for the benefit of agriculture and the mechanic arts;" and, in so doing, there would be no great likelihood of a misunderstanding or conflict with the Washington officials.

The fact that the State is the active, right-at-hand agency for directing our college work, is a sufficient explanation of the different forms that work assumes and the diverse views sometimes entertained by college representatives regarding it. We, as college men, may consider, discuss, and argue until we reach an agreement—were

that possible—as to what the land-grant college should do and should not do, yet that agreement must find expression in the laws of the various States before it can be made forceful in changing, to any great extent, college management. Primarily, the Congressional acts suggest certain lines of work with more or less definiteness; ultimately, legislative enactments in the States close the question against all but local debate. A college preparatory school is a necessity, if the standard of scholarship for entrance to the college is too elementary in consequence of legislative action. Left to act upon our own judgment, few of us would make admission to the institution with which we are connected as easy as it is now. I think a pronounced vote of this body would favor raising the standard of scholarship all along the lines of educational effort with which we come in touch. Most of us feel, doubtless, that our work suggests specialization of effort on the part of students too soon, and that a fairly broad foundation of general scholarship should underlie the attempt at specialized effort in every field of human activity. We may agree upon these things here, but unanimity of opinion among us does not change the necessity for obeying the law at home. "Good thoughts, though God accept them, yet toward men are but little better than good dreams unless they be put in act."

COLLEGE AND EXPERIMENT STATION.

I think it is beyond discussion that the law of Congress contemplates a vital connection between the land-grant college and the experiment station. True, this union is not forced, some discretionary power being lodged with the law-making power of each State; but the evident intent of the law known as the "Hatch Act" is that the experimental work in each State shall be prosecuted in close contact with the college and under the supervision of its governing board. The wisdom of this working policy has not been gravely questioned. Provision is made in the law for a division of the experiment station fund between two colleges, if there be such in the same State. Where experiment stations had been established prior to the approval of the act of 1887, the States wherein they existed were not forced to abandon them in order to share in the distribution of the fund provided by that enactment. A then-existing university was entitled to the benefits of the act—by special legislative action—provided there were established in connection with it "a separate agricultural college or school, which shall have connected therewith an experimental farm or station."

When the Hatch Act became operative, Colorado was placed in a most favorable position for the utilization of the experiment-station fund. There had been established, nearly ten years before, an educational institution, having no educational or governmental union with any other, known as the State Agricultural College. There was no other educational institution within the State that had a shadow of a just claim to ask any portion of the grants of money authorized by that act. In the legislative act making acceptance of the provisions of the Congressional act of 1887 is a section that reads as follows:

"That the State board of agriculture shall have the control of the fund appropriated by the said act of Congress, and shall disburse the same for the use and benefit of the agricultural experiment station department of the State Agricultural College, and in accordance with the terms and provisions of said act of Congress."

Legislative action, by Colorado, on another matter was not so wisely ordered and was not so fortunate in its issue. A number of substations were established and the college governing board was required to provide for their support out of the station fund received from the United States Treasury. In only one instance, in the history of the experiment station of Colorado, has there been a legislative appropriation for station support. This history is, doubtless, repeated in a majority of the States here represented.

While State control of the experiment-station work is widely permissible, under the terms of the Hatch Act, that control does not legally extend to a division of the Government experiment-station fund among a number of substations. In most cases these substations are unnecessary and bring about an unprofitable employment of station effort. The Government-station fund is rightly used in the support of one station in each State, said station being a department of an agricultural college or school either with a separate organization or in connection with some educational institution under State control. Any other use of this fund is clearly unauthorized by the Congressional action creating it.

In this connection I may record my conviction that there are but few cases where college support is had at the expense of the experiment-station fund. The converse is true in the majority of States, of whose college and station organization I have knowledge. A not inconsiderable part of the time devoted to station work, and much of the equipment employed in its prosecution, are paid for by drafts on the college treasury.

There has been some discussion in the meetings of this representative body, and elsewhere, as to the closeness of the connection that should exist between the col-

lege and the station. The closer and more vital that union the better for both interests, is an opinion I have entertained ever since my attention was given to the question. If the experiment station is to be a department of the college—and that to my mind is the plain intent of the law—its relation to the college should be on the same basis as the relation of any other department thereto. There must be no wheel within a wheel so adjusted as to admit of the possibility of their attempting to turn in opposite directions. The president of the college is the logical head of the experiment station, as he is, unquestionably, that of any other college department. I do not mean that his headship is to be shown by a direct personal supervision of departmental work, or even that he is to be learnedly conversant with the details of that work, but that in his executive capacity he is the legitimate head of the whole college system, whether of few or many departments. There is nothing inconsistent with a wise ordering of station work by the college executive even though he be no specialist in science and stand confessedly incapable of prosecuting experimental work supposed to be the forerunner of more successful farming. What occupant of the executive chair of an educational institution could undertake, personally, to conduct all phases of class room and laboratory work with which his executive functions bring him in contact?

The ideal station director, as some attempt to describe him, should be a specialist in every known department of science—a chemist, an entomologist, an agriculturist, a botanist, and so on through the list until the nomenclature of scientific specialists is exhausted. It is not strange that a professor coming to the directorship of the station, with supposedly this amount of scientific qualification tacked to him and properly labeled, should soon come to regard himself as a "bigger man" than the chief executive of the college.

There is no executive function connected with the work of the experiment station that can not be performed by one qualified properly to supervise the general workings of a college. A union of director and president in the same person gives coherency to all the work and is in the interest of economy and harmony. Next to the president, the agriculturist of the college would seem to be the one most naturally eligible to the office of director; but the appointment of the head of one college department to direct work with which other departments are closely connected has its obvious disadvantages.

Another question having connection with others herein suggested is, Shall the heads of college departments, to whom teaching hours are assigned, constitute the scientific working force of the station? This is a question about which, as about most others, something sensible can be said on both sides. I believe there is strong reason for saying that the capable teacher, possessed of the true scientific spirit, will prove the most serviceable worker in the station; yet few rules are without their exceptions. The professorial duties of the station worker must be so ordered as to give him time to devote to experimental work. Herewith I insert some language found in my last report as director of the experiment station:

"I think it can be affirmed that most scientific men, who give instruction and make investigations at the same time, as do the station and college workers now in mind, have a decided preference for the experimental side of the field upon which they bestow thought and effort. Their reports show a decided inclination on their part to emphasize the importance of the scientific and experimental investigations which they have under way and an evident desire to be released as much as possible from the cares and duties of the class room. The tendency in the direction indicated is too strong to escape notice. It much more than counteracts any loss of experimental attainment by reason of periodic application to the work of instructing classes and supervising laboratory exercises.

"There is a closer connection between the scientific work of an agricultural college and the experimental work of the station connected with it than is usually supposed to exist. The one qualified to conduct experiments in agriculture ought to be one well fitted to give instruction to a class of students studying the subject. The scientific training that gives the chemist ability to analyze soils, waters, fertilizers, and food products makes him all the more serviceable in the class room or laboratory in the presence of a body of students. The plan of articulating the work of the college and the station as closely as possible is sound in theory and fairly satisfactory in practice."

S. T. Maynard, of Massachusetts, read the following report from the Section on Horticulture and Botany:

Report of the Section on Horticulture and Botany.

In making a report of the condition of the section that shall give an adequate idea of the work of these departments I am laboring under the necessity of condensing and tabulating a very large amount of material into a very small space, and no attempt will be made to cover the entire range of work—only a few phases of the work of each department.

To obtain sufficient data for this report a series of questions were sent to the heads of each department requesting brief replies. Although but little time was allowed for answers a very large majority (over thirty) promptly returned answers in as full detail as could be expected, and my report to you will be a brief summary of the conclusions derived from these answers.

BOTANY.

The replies, thirty in number, from the botanists indicate that the total number of students in botany at the land-grant colleges is 1,600. Of these about 400 are studying botany with a view to its application in the future practice of some line or lines of agriculture or horticulture. The replies show that on an average three hundred hours are given to this subject during the college course, the time being about equally divided between text-book or lecture instruction and laboratory practice. About 50 students are reported as pursuing advanced studies with the idea of teaching or engaging in station work, and 55 are taking post-graduate work for an advanced degree. Fifteen botanists report more or less work in the line of botany or nature studies in the public schools.

The aim of the questions was to learn how far the science of botany is taught in our land-grant colleges with the view of educating those who are to follow some line of agriculture or horticulture as teachers in schools and colleges or as experiment-station workers.

I look upon the science of botany and plant physiology as bearing the same relation to the practice of horticulture as that of zoology and animal physiology to the practice of medicine, while botany and zoology bear similar relations to the practice of agriculture.

The conclusions to which these answers seem to lead are that a very large number of the students attending the land-grant colleges study botany as a matter of general education rather than to fit themselves for a special line of work, and that but a comparatively small number are devoting their time to this study as a preparation for agricultural pursuits.

HORTICULTURE.

The replies, thirty-one in number, received from the horticulturists indicate that during the past year there were about 700 students engaged in the study of horticulture in the land-grant colleges, 250 of whom are pursuing the subject with the idea of fitting themselves for the practice of some line of horticulture and 15 are preparing for experiment station work. From twenty-four to four hundred and eighty hours, with an average of three hundred hours, are given to text-book and lecture instruction, and about two hundred hours to laboratory, field, garden, or greenhouse instruction. About 110 of the students were considered proficient enough at the end of the course to begin successfully the practice of some line of horticultural work.

The above figures show that the number of students who are fitted to follow successfully the calling for which this course of study was intended to give special training is very small, compared with the number who pursue the course (less than one-half), and as compared with the number of graduates of other special schools and colleges who follow the calling for which they have received special training.

The questions which naturally come to our mind at this conclusion are, Whether the training we are giving our students in horticulture is all that it should be; whether the number of students who take up this line of work is small because they do not see attractive or remunerative openings for them when they have obtained their education, or whether it is due to some other cause or condition that can be remedied?

From long experience I look upon the business of horticulture as one of the most difficult of all callings, one that requires the broadest foundation based on the natural sciences and a great deal of technical skill, but a calling in which the broadly educated energetic business man can certainly obtain as large remuneration as can be obtained in other callings or professions, and it is a question if, in teaching this complicated branch of agriculture, we do not fail in some degree to apply the principles of theory and practice that are applied in the other technical schools and colleges.

As students go out from us do not too many of them go out not fitted to take up successfully any of the lines of horticulture, but must drift about until they have obtained the required degree of technical information and skill?

These conditions may perhaps account for the unpopularity of the agricultural and horticultural departments of many of the land-grant colleges where instead of drawing the large numbers of young men from the farms who should become thoroughly educated and successful agriculturists and horticulturists there are but few or none at all.

I find it even more difficult to formulate the answers as to experiment-station work. A list of 14 questions was sent out, to which 34 replies were received. These replies indicate 72 different subjects or lines of work, in many cases the same work being reported by a more or less large number of stations. These subjects, with the number of stations giving attention to them, are as follows: Variety testing of fruits (21); fertilization and cultivation of orchards (12); fungi and fungicides (11); variety testing of vegetables (10); testing spraying pumps and nozzles (10); hybridizing and crossing fruits (10); insects and insecticides (9); floriculture (9); vegetables under glass (8); native plums (8); fertilizers for vegetables and fruits (7); pruning and training trees and vines (5); nut culture (5); forestry (5); greenhouse construction (5); sterility and fertility of fruits (5); ornamental trees (4); potatoes (4); Japanese persimmon (4); Japanese plum (3); fruits under glass (3); acclimatization of economic plants (3); tomatoes (3); botanical relation of fruits (3); root grafting of large fruits (3); artificial light on growth of plants (3); races of peaches (3); muskmelons (3); potash as affecting the strawberry (3); temperature of water as affecting the growth of plants (3); weeds (3); soil as adapted to fruits (2); protection of garden crop from frosts (2); growth of plants under glass (2); girdling and pruning the vine (2); vegetable physiology (2); best stocks for plums (2); plant variation (2). The following are reported by one station each: Acquisition of nitrogen from the atmosphere; herbaceous peonies; cranberry culture; cultural methods in growing the onion; propagating roses; grape stocks; preserving and improving the color of fruits; alkalies as affecting seed germination; plants from immature seeds; resumption of root growth in spring; winterkilling of buds; blueberries; variations of varieties; date palm; sand plum; natural history of the State; fruit history or industry of the State; transplanting as affecting maturity of vegetables; methods of propagating nut trees; winter forcing of asparagus; effect of iron on color of fruits; study of mushrooms.

This list, although covering a very wide field, is but a small part of the work being carried on by the station workers, as only the more important lines were reported, and almost every station takes up some new line every year. The demand coming to the station workers from the people for advice and instruction by correspondence, by lectures before institutes and other public meetings, and by personal visits is steadily increasing and is, together with the large number of printed reports, an enormous factor in the education of the agricultural classes which must result in rapid strides in their advancement and material prosperity.

The replies indicate that the majority of the stations grow the crops on the station grounds upon which they are making special experiments. The area devoted to this work varies from the small greenhouse or garden plat to fields of over 65 acres. Cooperation with commercial growers is practiced to a greater or less degree by 26 of the 34 stations, from which answers were received in various ways, by supplying materials like fertilizers, seeds, plants, or trees, insecticides and fungicides, or by directing or assisting in the work, or by advice and instruction.

Where cooperation is practiced it is reported as valuable—in many cases from the valuable results obtained from the work, but in more cases from the broader view the station worker obtains of the needs of his constituency, and especially the closer touch into which it brings the station and the people.

Eight reports were received in favor of substations for horticultural work, though considered expensive; ten are in favor both of the establishment of substations and of cooperation with individual growers, and fifteen think cooperation by far the most valuable manner of conducting the majority of the ordinary horticultural experiments. The more difficult scientific problems, however, can be carried out successfully by specialists only.

Twenty stations report seed-testing apparatus more or less complete. In several cases this work is in the hands of the botanist. Eight report no seed-testing apparatus.

Eighteen favor seed inspection, some urging the inspection of all kinds of seeds, others, seeds of the grasses and grains only. A number would not undertake the work except with a special appropriation from the Government for the purpose. Ten oppose seed inspection, and six make no report.

Twenty-four report more or less work in the production of new varieties of fruits, vegetables, or flowers. Several stations are conducting the work for the development of types or principles, some incidentally in following other lines, but the majority for the production of better varieties or those better adapted to special localities than those in general cultivation.

Thirty are engaged to a greater or less extent in variety testing. Several of these are testing only new varieties of promise, and some only along narrow lines—one or two kinds or types, as Japanese plums, native plums, hardy fruits for the North, pelargoniums, etc. Four devote no time to this work.

Twenty-eight consider this work of more or less value. Those who think most highly of the work urge its importance as a training for the station worker, its value, when properly conducted, to the growers, the fact that the people demand it, and as a valuable means of keeping in touch with the people. Those who consider the work of minor importance argue that it is expensive, that results can only be valuable locally, and that other lines of work are more important.

The majority reporting were strongly against legislation to prevent loss to growers who buy high-priced novelties which subsequently prove of less value than old standard sorts, the general opinion being that education would remedy this evil.

Seven report substations for variety testing, but consider them expensive because of the skilled men needed at each. Twenty report no substations. The majority of those reporting held the view that in large States and where the climatic or soil conditions take a very wide range substations are valuable and desirable.

The problems that confront the experiment stations are numerous, covering a very wide range, and are practically the same in all the States. They may be summarized as effort and advancement along all lines of the sciences that bear upon agricultural operations and the education of the agricultural classes in the best methods for the production of the largest and best crops with the least cost.

The problems of the land-grant colleges are of even wider scope, as both agriculture and the mechanic arts are to be fostered in a majority of the States, thus dividing the forces in a manner often not to the best interest of either line of educational work. In Massachusetts the work is simplified, as the education of the people of that State in the mechanic arts is provided for by the assignment of one-third of the land-grant fund to the Massachusetts Institute of Technology, thus leaving to the Massachusetts Agricultural College the duty of educating its agricultural classes, and making it practically impossible for it to obtain an equipment for educating its people in the other industrial callings that can, even in a small degree, compete with the largely endowed and splendidly equipped institutions for other lines of industrial education within the State. And I hold that we are especially fortunate in this condition of our agricultural college, for I believe that the agricultural and horticultural interests of this State and many other States of the Union are of sufficient importance to warrant and demand that the entire effort of one well-endowed and thoroughly equipped institution be given to the broadest and most liberal education of the agricultural classes.

S. T. Maynard, *Chairman.*

G. E. MacLean, of Nebraska, introduced to the Association Mrs. Calvin S. Brice, of Ohio, as a member of the advisory council of the George Washington Memorial Association and a trustee of a college in Ohio. On motion she was made a corresponding member.

H. H. Goodell read two sections from the constitution relating to admitting as members of the convention delegates from other institutions engaged in educational or experimental work, and moved that delegates from other institutions and any other persons eligible to membership in the Association under these provisions of the constitution be admitted.

The motion was agreed to.

J. B. Smith, from the Section on Entomology, read the following report:

Report of the Section on Entomology.

It was indicated by the secretary of this Association, in his notification to the officers of the section, that it might be wise to attempt to secure a program upon the subject of "Entomology in our agricultural colleges, the methods of teaching, scope of the work," etc. The attempt was made, the program has been prepared, and some, at least, of the papers are ready for presentation.

As an introduction to the subject of what is desirable, or what in the opinion of those that present papers should be aimed at, I have considered it as useful to present a statement of what actually exists—of just what has been accomplished by individuals or institutions working out independently the problems presented to them in accordance with the requirements of their surroundings. I have mentioned individuals as well as institutions, for after all it is in most cases the man at the head of the department that makes its standing and determines its development. He may be hampered, opposed, or delayed, but if he has enthusiasm and pertinacity of purpose his department does develop somehow, and its standing is sooner or later recognized by the governing body.

To get the necessary facts, a circular letter was sent to 39 State or agricultural colleges where the faculty contained a professor of entomology, zoology, or agricultural science, and replies were obtained from 24 teachers giving in more or less

detail information on the following points: What is now done in teaching entomology; what text-book, if any, is used; how many hours are devoted to the work and how much of it is laboratory work; whether collections are made by the students; what outfit is available, and, in general, the object of the course and the method of obtaining that object.

Of the fifteen States from which no reply was received, published data were accessible in only two instances; but it is not likely that anything could be added from the States in question that would change the general conclusions reached here.

And first of all, it is demonstrated that a course in entomology sufficient to start a student into independent or original work can now be obtained in every section of the United States—not in every State, but in every general region. This is a vast change from the condition of affairs ten years ago, when entomology as a separate branch was not taught in more than three colleges or universities. In the general courses in zoology, where such were offered, insects were considered in their turn and a varying length of time was devoted to them; but this was usually the extent of the entomological knowledge secured by the student in most colleges or universities.

As the experiment stations were organized and the agricultural colleges were enlarged and strengthened by Government assistance, the vital importance of economic entomology to successful agriculture became obvious. Entomologists were in demand and the supply of properly trained men was hardly sufficient. Inexperienced men or makeshifts were secured in some instances, and some of the first of the entomological publications were unequivocally poor. Too often entomology was saddled upon an already overloaded professor of some other subject, and a bulletin or two on "bugs" was expected as a sort of pastime when there was absolutely nothing else on hand.

But even this changed, although there is even now an immense distance between Alabama, where all of zoology is given five hours a week during one term, entomology coming in for a week or two at most, and New York, where at Cornell University one professor and two assistants teach entomology during the entire course, and a summer term is offered in addition.

Cornell University has always offered the greatest opportunities to students in this branch, and it is yet first in teaching staff and general facilities, although Massachusetts now makes a very close second.

To quote Prof. C. H. Fernald of Massachusetts: "My laboratory contains every good idea I have ever seen in any other laboratory, and nothing has been spoiled by the fancy of the architect. In equipment we have everything needed or useful in the work thus far done or still going on, and when any new work is taken up all necessary specimens, books, or equipments are obtained, so that nothing necessary to the best kind of work shall be wanting. "My great ambition is to build up the best school of entomology in existence, and if there is any school where better opportunities are afforded it must certainly be a fine place."

Illinois also offers unusual facilities for the student.

Of course these States are exceptional developments, and in each case the man has made the very best of the opportunities offered and created others to be made use of in turn.

I find that the average length of time devoted to entomology, aside from the States mentioned, is nearly two terms. Six colleges require one term only, seven require two terms, while three terms are required in two institutions only. In several there are optional courses for advanced classes and in others a course of insecticide and fungicide work supplements the regular course.

Collections are required in thirteen of the institutions and in three others they are encouraged. In almost all such cases students are given some training in the manual work of preparing or mounting the specimens. The amount of collecting also varies from "so far as possible" and "representatives of all orders" to a definite number, like 75 or 100 species.

Laboratory work is a feature in all courses and usually at the rate of two hours of laboratory work for one of recitations; but as to the equipment of the laboratories quite a number of the replies are eloquently silent. Nevertheless, ten mention a good equipment, and at least six of these are sufficient for all the work reasonably required.

Field work is especially mentioned in seven cases, and the study of transformations in four. The economic side is especially mentioned nine times, and the course seems to be limited to agricultural students in two cases, to agricultural and scientific or biological students in three cases.

In most instances the courses are general and usually they are in the junior or senior year. In several cases elective courses for these years are offered where the required work comes earlier in the course.

Graduate courses leading to a master's or doctor's degree, with entomology either as major or minor, are offered at five institutions, including the three that are first separately mentioned.

Text-books are mentioned fourteen times; in five cases it is especially stated that none are required, instruction being mainly by lectures and laboratory work, and in the other cases the matter was not touched upon at all.

Comstock's Manual is used exclusively in four cases, combined with the Elements of Insect Anatomy in two others.

Smith's Economic Entomology is used exclusively in four cases, with Comstock's Manual in two others.

Packard's Entomology for beginners is used in one case and so are Weed's Life Histories of American Insects and Spraying Crops. The two latter combined with Smith's Economic Entomology are used as works of reference in one instance.

In one case the suffering students are compelled to use Comstock, Smith, Hyatt and Arms, Packard, Sharp and others; so the professor says, at any rate, but I hope he is mistaken.

As to the aims to be attained, there are two quite well-defined types. The one is fairly exemplified in the following quotation:

"My object in the work is to fit the men as thoroughly as possible in this department for the special work they desire to go into, whether general farming, fruit growing, market gardening, floriculture, forestry, greenhouse work, systematic entomology, economic entomology, station work, biology, histology, medicine, or any line of entomological work a student may desire."

The other is much more modest and aims to put the student in such a position as to be able to continue work on his own account or to begin a post-graduate course in the better equipped laboratories of the first series. To this class belong most of the agricultural colleges, and here the teaching given in entomology generally suffices to ground the student in insect anatomy and physiology, in the outlines of classification, in the methods of discriminating between probably injurious and probably beneficial insects, and in the bearing of these facts on the insecticide problem or the economic application to reduce or prevent insect injury.

In a full college course the time that can be given to any one special subject does not often permit of more work than above outlined. Three terms, averaging ten hours a week for both recitation and laboratory work, are none too many, in my own experience, to obtain this result. Some men that are especially interested of course accomplish much more; but our courses must be built for the average man who is no more interested in entomology than in any other branch.

It is, on the whole, remarkable how generally similar aims and similar methods have obtained throughout the country without especial cooperation; and it is perhaps an indication that aim, method, and growth are all normal and sound.

It seems to me that no student of agriculture should be content with less than is aimed at by the best of the teachers in the second category above given, and this will require not less than three terms of six hours per week, at least half of which should be spent in the laboratory. It may be supplemented by a few hours of practical work in preparing and applying insecticides and in becoming acquainted with insecticide machinery.

The amount, and, indeed, the character of the laboratory work will be largely determined by the location of the institution and its surroundings, as well as by what is required in other branches.

The relation of entomology to agriculture and especially to fruit growing is much more important than is generally believed, and until that relation is fully made clear in the agricultural college entomology can not take its proper place in agricultural science. A very long step has been made, no doubt, to this end, and I am sure that others will be made in the near future. It is not so long ago that entomology was scarcely considered as a science; it has now made a secure place for itself and its growth will continue with opportunity.

As the professor of entomology is also in most cases the entomologist of the experiment station, the work issued in the form of bulletins from such stations deserves at least a few words of general notice.

When the first bulletins on insects from the new experiment stations came into my hands, before I was myself connected with any station, I felt that all that had been accomplished was to open the door for a mass of rehashed material of no earthly use to the farmer or anyone else, and I expressed my feelings in print editorially. I am as free to express them now, to a different effect: Scarcely any bulletin on insects now comes to hand that does not show original work, even if the species is an old one. Much of our knowledge of known forms has been completed or made more definite; much improvement in our means of dealing with them has been made, and, finally we have learned that as men and animals in a measure partake of the peculiarities of their surroundings, so do insects as well, and it is unsafe for the man in Utah to recommend to his constituents some method or material simply because the man in New Jersey found that it answered in his State.

The bulletins, therefore, while primarily intended for the agriculturist, have also become a storehouse of facts for the student of insect life, and many of the writers have become interested in more scientific and systematic work, adding largely to our general stock of knowledge. As to just what the bulletins should contain, that is another story.

All of which is respectfully submitted.

J. B. Smith, *Chairman.*

R. J. Redding, of Georgia, read the following report from the Section on Agriculture and Chemistry:

Report of the Section on Agriculture and Chemistry.

In the investigations and inquiries in search of facts upon which to base this report, it was thought expedient, for variety's sake as well as from intrinsic considerations, to depart somewhat from the usual lines heretofore followed. Opportunity has been afforded the administrative officer of each station to present something like a general review of its work, covering (1) the attitude of the farmers of each State toward its station; (2) the important and conclusive results reached; and (3) the extent to which such results have been accepted and applied to practice by the farmers.

In accordance with this scheme, a circular letter of inquiry was sent to the director of each of the stations in the United States early in June. Replies, more or less full and satisfactory in their scope, were received from 39 stations. No replies were received from the following stations: Arizona, Delaware, Missouri, Nevada, New Mexico, North Carolina, Oregon, South Dakota, Tennessee, Virginia, and West Virginia. Were it not for the well-known pacific dispositions of the directors of these 11 stations, together with considerations of age or of physical qualifications, it might have been surmised that they had "gone to the war." Assuming, however, that they were at home, notice is now given that any apologies, in good faith tendered, will be cordially accepted and no questions asked.

Question I.—*Please state the attitude of the farmers generally toward your station, whether of friendliness and confidence, or of indifference and distrust.*

It would be interesting to give in full the replies to this question from each station, but the twenty-minute rule virtually forbids. It may be sufficient to say that the consensus of judgments, the whole mixed and boiled down to a uniform consistency, might be stated in these words, which are directly quoted from one of the station reports: "The attitude of those farmers who are acquainted with the station work is one of friendliness and confidence, and this sentiment is growing. On the part of those who know nothing there is a manifest indifference, and in some few cases active hostility."

In digesting the replies to this, as well as to the succeeding questions, some allowance must be made for the personal equation of each one who replies. But it is gratifying to note that the farmers in nearly every State who know anything of the workings of their station are not only very friendly, but in some States they are even enthusiastic.

Without any purpose to be invidious, a few short quotations are here made from the reports received from the several stations: Alabama—Friendly and growing more so. Arkansas—Perfectly friendly and eager for bulletins. California—Very friendly. Connecticut (New Haven)—General friendliness and confidence. Connecticut (Storrs)—Entire friendliness and confidence so far as known. Florida—Correspondence indicates friendliness. Georgia—Generally friendly and confiding on the part of those who are familiar with our work. The more intelligent are the more friendly; the more ignorant, the more prejudiced. Idaho—Merely apathetic. Illinois—Extreme confidence and friendliness. Indiana—Friendliness and confidence. Iowa—Friendliness and confidence of all who are familiar with our work. Kansas—Majority friendly and give evidence of careful study of bulletins. Kentucky—Very friendly. Louisiana—Utmost friendliness and confidence, except on the part of a very few. Maine—Great friendliness and confidence; could hardly ask or hope for greater. Maryland—Majority friendly and appreciative. Massachusetts—No question but that we have won not only the friendliness but the confidence of farmers throughout the State. Minnesota—Farmers show much interest in and appreciation of our work. Michigan—Majority friendly, but a minority of considerable size and aggressiveness are hostile. Mississippi—As is usually the case in this world, we get approximately what we deserve. [Rather evasive, a lawyer would say.] Montana—Could not be more agreeable. Nebraska—Friendliness. New Hampshire—Majority friendly. New Jersey—Friendly and confident. New York (Geneva)—Friendliness and confidence. New York (Ithaca)—Extremely friendly. North Dakota—Both kinds are found, but the latter are hard to learn of. Oklahoma—An increasing friendliness and confidence; almost no unfriendliness. Ohio—Intelligent farmers unanimous in its support. Pennsylvania—Growing friendliness and confidence; has

a secure position in the State and an increasing influence in all agricultural matters. Rhodo Island—Decided friendliness and confidence on the part of the majority. South Carolina—Friendly and cooperative. Texas—Within a radius of 150 miles, friendliness and confidence of the intelligent farmers. Vermont—No distrust manifest; the uninformed are indifferent; up-to-date farmers friendly and appreciative. Washington—Distinctly friendly and confident. Wisconsin—Farmers generally favorably disposed. Wyoming—Indifferent; they do not care to know much about us; of course there are notable exceptions.

It may be safely assumed that the sentiments of the farmer constituents of the eleven nonreporting stations are about on a par with the average of the above named.

This exhibit should be considered, on the whole, as quite gratifying. Doubtless some of the reports might be somewhat modified or toned down, while others might be made a little brighter, if judgment were made up and prononnced by one mind fully informed of the facts in every case. As a caution to any who may need caution and a solace to the unappreciated, the words of the Great Teacher may be recalled: "Woe unto you when all men speak well of you."

QUESTION II.—*Since its organization what important and conclusive results have followed laboratory and field investigations and experiments conducted by your station? (Applies to both original work and investigation.)*

Perhaps the mind of no one man is fully capable of passing judgment as to the measure of value and practical importance that should be attached to the results that have been reached at each and every one of the experiment stations in this country. It was believed that a statement of such results from the director of each station might aid in forming a more comprehensive estimate of the importance and value of the whole. It would be impracticable within a reasonable space and time to present more than a syllabus of the replies to this question. Perhaps it may be sufficient to present a general outline of the results in a few selected States representing different sections of the country.

For convenience I have adopted the general divisions as used in the United States census of 1890:

North Atlantic Division.—Requirements of the soil for fertilizers; value of crops for feeding stock; the use of the Babcock system for determining butter fats; treatment of fungus and insect enemies to crops; rational buying and compounding of fertilizers; more intelligent use of fertilizers; emphasizing the value of manures; value of tillage; ferments in cheese; bacteria in milk; nitrogen-fixing organisms; surface tillage of orchards; tomato blights; tuberculosis of cattle; entomological investigations; greenhouse experiments in regard to the acquisition of free nitrogen by legumes; experiments in human nutrition (Storrs).

South Atlantic Division.—Utilizing the entire product of the corn plant; spraying vegetables and fruits; culture and fertilizer experiments on tobacco; practical dairying according to improved methods; variety, fertilizer, and culture tests of cotton, sweet potatoes, peaches and plums, and trucking; exposing humbugs in plants, seeds, and fertilizers; sirup and sugar making; economic value of cowpeas; the exploitation of the new legume, "velvet" bean; ginseng culture; cotton hybridization and crossing; discovery of a fungus parasite of San José and other scales (Florida).

North Central Division.—Variety tests of grains, fruits, and vegetables; shallow culture of corn; relative cost of beef and butter; sugar-beet culture; potato scab; tile draining; exposure of and suppression of sales of fraudulent phosphates, valueless seeds and plants; fungus diseases and insect depredations; suppressing bad weeds; dissemination of Manshury barley; pig feeding; discovery of enzyms in milk (Wisconsin); round silo (Wisconsin); comparative value of animal foods, correlated to market prices; effects of different methods of farming on soil fertility; superior excellence of well-bred cattle in relation to market value of finished product; variation in cost of production by dairy cows of various breeds and types; potato-scab treatment; millet feeding to horses; effect of dehorning cows; fattening sheep; bad effects of alkali waters; animal pathology, especially of hog cholera; introduction of Kafir corn; loss from cooking grain for swine; effect of proteins in pork making, etc.

South Central States.—Conclusive results of field investigations of fertilizers; modified method of nitrogen determination; variety, fertilizer, and culture tests of staple field crops—cotton, corn, oats, sugar cane, sweet and Irish potatoes; the economic value of the cowpea as a hay producer and soil renovator; the economic value of cotton-seed products, especially with reference to animal feeding; methods of conserving soil moisture; improving worn soils; trucking.

Western Division.—Reclamation and cultivation of alkali soils; insect pests; irrigation; "everything that can be determined about 'our great forage crop,' alfalfa," (Colorado); fruit culture; grasses for semiarid soils (*Bromis inermis* and *Vicia villosa*); feeding value of wheat

The foregoing compilation makes hardly a complete list of the subjects that have

been under experimentation and investigation. In the effort to save space some matters, even of importance, have been left out. From all of these investigations there have followed results of importance and value, and some of transcending value.

Before this body of teachers and investigators it is not necessary to present a list of what might be considered the most important and valuable results, crediting each to individuals and stations, and giving "honor to whom honor is due." That would be an ungracious task, and certainly it would be embarrassing.

It was no part of the scheme of this report to hold up the several stations, or the individual workers thereof, by States and names, to either favorable or adverse criticism. The promise was made in the circular letter accompanying the questions sent out, "not necessarily for publication," the effect of which, doubtless, was to take away the veil of modesty—a grace to which station workers have as much right to lay claim as anybody else I know of, except college men. Such a compilation of results achieved would not serve as a decisive test of the relative effective values of the work of the several stations, even if intended for such purpose. One of the most experienced and accomplished of the station directors enters the following demurrer at this point: "It seems to me a mistake to attempt to gauge the value of a station by the number of single, striking, or as you phrase it, 'important and conclusive results' that have followed its work. In a measure, of course, this is legitimate; but it seems to me that it tends to educate our constituents into the habit of looking for something new and startling, which, in the nature of things, can not often be furnished them. The work of the station, in my conception of it, is of a very prosaic and, if you please, plodding character in its main features, and is really a work of gradual education of the farmer." This demurrer is cordially sustained, and a disclaimer is entered that no such purpose was intended.

QUESTION III.—*To what extent have such results been accepted and practically applied by the farmers of your State and section?*

Even greater difficulty would attend any effort to tabulate the replies to this question than was presented to the first and second questions. It is manifestly impracticable to reduce all these fractional replies to a common denominator and then sum up the whole into a concise and accurate answer, as one would do a sum on the blackboard. A few representative statements from the replies may serve the purpose of giving a sort of general view of the extent to which farmers have accepted and reduced to practice the teachings of station experimentive work: "Some of our conclusions have been generally adopted;" "accepted and applied by all progressive farmers, and these have been imitated by the less progressive;" "results have been extensively applied;" "the Babcock system of determining fats has been adopted as the basis of payment" (this applies to all dairying States); "very generally;" "adopted by farmers in a limited way;" "quite generally accepted and applied;" "Kafir-corn culture generally adopted as a result of station experiments and conclusions;" "scarcely a result attained or verified by our experiments that is not at once adopted;" "first deep cold setting of cream, then the use of the separator, the use of the Babcock tester, the value of silage, methods of suppressing tuberculosis of cattle, have been generally accepted and adopted;" "quite generally accepted and adopted;" "farmers are largely following our teachings;" "not as extensively as could be desired;" "we note a vast improvement in farm work since this station was inaugurated;" "we know that our influence is rapidly spreading—we have conscious and unconscious followers;" "one-third of the total number of farmers in the State have personally requested our publications;" "no means of knowing;" "improved dairying methods have been generally adopted on farms near cities and towns;" "as great readiness to accept and apply results as was expected or could have been wished."

The foregoing constitute but a small portion of the replies to the question, but sufficient, it is thought, to give a general idea of the extent to which farmers have accepted and applied results of station work. The careful reading of all the replies to the three questions can not fail to encourage the conviction that the experiment stations, as a whole, are doing a very great work for agriculture in all of its branches and departments. So far as immediate practical results are concerned, it will perhaps be conceded that the department of animal industry, especially dairying, has received the greatest impetus, closely followed by the advancement in the intelligent composition and application of fertilizers.

It may not, however, be considered as within the proper scope of a report of this character to enter into a discussion of the question as to which department of rural industries has received the greatest practical benefit from the labors and researches of experiment station workers; and perhaps if it were a germane inquiry it would be hardly worth while to enter upon it.

In reading closely the large amount of information presented in replies to questions sent, couched mostly in pithy sentences and phrases, at least one very suggestive general conclusion may be drawn. It is this: That the extent to which a well-equipped experiment station shall impress itself for good on the agriculture of

a State will depend essentially upon the degree to which such station keeps itself "in touch" with the farmers of that State. It were useless to pile up the pigeonholes of the archives with results and conclusions, however valuable theoretically. It would be almost equally useless to publish these results, however valuable they might prove in practice, in an "unknown tongue," or in the language of high science.

In addition to the use of the simplest, every-day language in the preparation of bulletins of results, and their wide distribution, there should be frequent personal contact, face-to face talks with the farmers. It is easy to note that in those States where the farmers' institute has become a factor in the work of disseminating agricultural knowledge there is more hope and encouragement to the station workers and more friendliness and confidence and cooperation on the part of the farmers. This fact is distinctly stated by more than one of the directors of stations in which these institutes have reached a degree of development, and the need of them is as urgently expressed in other States wherein this work has not yet been inaugurated.

All of which is respectfully submitted.

R. J. Redding, *Chairman.*

H. P. Armsby, for the committee on station exhibit at the Paris Exposition, read the following report:

Report of Committee on Collective Station Exhibit at Paris Exposition.

The action of the Minneapolis convention, under which this committee was appointed, provided:

(1) That the executive committee be directed to confer with the honorable Secretary of Agriculture to determine what assistance the Department of Agriculture will give.

(2) That a special committee of five persons be appointed, of whom the Director of the Office of Experiment Stations shall be one, to prepare the exhibit.

The duties thus assigned, respectively, to the executive committee and to the special committee, while distinct, are intimately related, it being obviously necessary to formulate at least a general and tentative plan of the exhibit in order to be able to present the subject with some degree of definiteness to the Secretary of Agriculture; while, on the other hand, the action of the special committee in the preparation of the exhibit must be conditioned by the kind and degree of assistance given by the Department of Agriculture. Accordingly, all action thus far taken has been substantially the joint action of the executive committee, represented by its chairman, and the special committee, and similarly, as a matter of convenience to the convention, the subject is reported upon as a whole at this time.

At the time of the Minneapolis convention, and for some months subsequently, there was no certainty as to what action would be taken by Congress regarding the participation of the United States in the exposition or as to what financial provision would be made for it. In view, however, of the importance of maturing its plans as early as possible, a meeting of the committee was held in Washington, October 29 and 30, 1897, at which the chairman of the executive committee and all the members of the special committee were present. At that meeting a general plan for the proposed exhibit and for the organization of the work was agreed upon and presented to the Secretary of Agriculture. The Secretary received your committee most cordially, expressed his general approval of the plan, and assured the committee that he would do his utmost to aid in successfully carrying out the plan, and would give them such financial assistance as might be found practicable under Federal legislation relating to the exposition.

At that time Congress had taken no action aside from a formal acceptance of the invitation of the Republic of France and the appointment of a special commissioner. In the second session of the Fifty-fifth Congress definite provision for participation by the United States was made in the form of a Senate amendment to the sundry civil bill, directing the appointment of a commissioner-general and assistants, and making an appropriation of $750,000. Of this sum, $75,000 may be used by the Secretary of Agriculture "to prepare suitable exhibits of agricultural products of the States and Territories of the United States * * * and * * * exhibit the same under the direction and control of the commissioner-general."

This bill was approved by the President on July 1, 1898; Commissioner-General Peck was appointed on July 28, and early in September sailed for Paris, whence he has but just returned. Mr. C. R. Dodge, appointed as the official representative of the Department of Agriculture, has also been in Paris until within a short time, and since his return has been occupied at Omaha in closing up the Department's exhibit there.

Under these circumstances it has not only been manifestly impossible to secure any definite assignment of either space or money for the proposed exhibit, but the unfortunate wording of the law has made it seem questionable whether a strict construction of it would not rule out altogether an exhibit of the kind contemplated.

Accordingly, your committee, while it has made considerable progress in maturing its plans, and has consulted freely with experts in various lines of station work, has not felt that it was in a position to ask the stations to go to the expense of the preparation of material which it had no positive assurance could be exhibited.

As the result of a recent conference with the Secretary of Agriculture, however, the committee now feels warranted in saying that an exhibit of the experiment stations as an integral part of the agricultural exhibit of the United States is practically assured, provided the stations are ready to do their part, although questions of space and cost still remain to be decided. Unless the unexpected occurs, therefore, your committee intends to begin the active work of preparation in the immediate future.

It seems proper, therefore, that we should take this opportunity to lay before the Association the general features of the plan which has been adopted for the exhibit, both for the consideration of the convention and for the general information of all concerned. As will be seen, the plan is essentially the same as that which was followed in the exhibit at Chicago in 1893.

(1) The action of the Association contemplates an exhibit by the stations only, and not by the colleges of which they form parts. Accordingly, all purely educational appliances, methods, or results are excluded.

(2) The action of the Association contemplates a collective exhibit. Your committee understands this to mean that in the preparation of this exhibit the stations are, so to speak, to club together—to "pool their issues"—and to present to the nations of the world a comprehensive showing of the nature, history, scope, and results of the experiment-station movement in the United States taken as a whole; that they are to subordinate their natural desire to make the best possible showing, each of its own work, to this paramount purpose, and to regard themselves as parts of a whole rather than as individual, independent institutions.

Both this fundamental conception of the exhibit and the necessary limitations of space and cost will preclude the showing of more than a small fraction of the work of any one station. The arrangement of the exhibit must of necessity be by topics, showing by selected examples the kind of work the American stations are doing upon such subjects as soils, fertilizers, crops, feeding, dairying, and the like. The contributions which the committee expects to ask for from the several stations will be selected from this point of view, and will not necessarily represent the judgment of the committee as to the relative importance of the several branches of a station's work. It might seem superfluous to dwell so long on this point had not experience in connection with the Chicago exhibit demonstrated the difficulty there is in securing general comprehension of this idea. The committee therefore desires to emphasize as strongly as possible that the exhibit which it is charged with preparing is to be, by a vote of the Association, a collective exhibit.

(3) The expense of the preparation of their contributions to the exhibit is to be borne by the individual stations, while it is expected that the cost of transporting, installing, and caring for them will be borne by the Department of Agriculture. The contributions made to the exhibit at Chicago in 1893 remained the property of the individual stations and were returned to them at the close of the exposition. It is presumed that the same arrangement can be made in this case, but your committee desires to propose, for the consideration of the Association, a different disposition of the exhibit. If the committee is successful in carrying out the work intrusted to it, the exhibit will possess permanent value as an epitome of station work. We believe, therefore, that it would be of material advantage to the stations if, after the close of the exposition, the exhibit, instead of being broken up into its constituent fragments, could be kept together as a whole and constitute a permanent exhibit in the Department of Agriculture.

We accordingly recommend that the several stations be asked to prepare their contributions in the expectation of their becoming part of such a permanent exhibit, and that the Association respectfully request the honorable Secretary of Agriculture to provide, if possible, suitable accommodations therefor in the Department at the close of the exposition.

(4) It is the intention to make the exhibit quite strictly technical in character. At the Chicago exposition the special aim was to interest the people of this country, and hence a large amount of demonstration material was in place. At Paris, on the other hand, the prime object should be to show to investigators, students, Government officials, and other experts, what is being done in agricultural research in the United States.

(5) It is proposed that the exhibit shall consist of:

(*a*) A comprehensive report on the history and present status of experiment stations in this country (illustrated with numerous photographic reproductions of buildings, equipment, etc.), together with a small illustrated pamphlet for distribution at the exposition, giving a popular summary of the main facts contained in the report. (To be prepared by the Office of Experiment Stations.)

(*b*) An exhibit by the Office of Experiment Stations, consisting of a complete set of the publications of the stations and of the Office, the card index, press bulletins, and other means of disseminating information; a collection of photographs of buildings and equipment, historical and statistical charts, etc.

(*c*) An exhibit, to be made up of contributions from the individual stations, illustrating by means of photographs, charts, models, or the objects themselves, special devices employed and notable results obtained in the various departments of station work. This portion of the exhibit is to be subdivided into groups, somewhat as at Chicago, and also to be arranged, so far as possible, to illustrate the four chief functions of the stations, viz, police duties, studies of natural resources and conditions, demonstration experiments, and original investigations. It is anticipated that this exhibit will have to consist largely of diagrams, photographs, and printed matter.

(6) The execution of this plan necessarily requires that the committee charged with the preparation of the exhibit, while soliciting suggestions and offers of contributions from all the stations, must in the end select the specific apparatus, methods or results to be illustrated, at the risk of seeming to discriminate between different investigators and different stations. Your committee accept this responsibility, relying upon the cooperation and forbearance of their colleagues in the stations, and, after securing the best expert advice obtainable, will, at the earliest practicable date, ask the individual stations to prepare such contributions as, in the committee's judgment, can be best combined into an effective and harmonious whole. In the performance of this difficult, and often delicate, duty we confidently hope to receive the friendly aid, advice, and support of all members of the Association.

Respectfully submitted.

H. P. Armsby.
A. W. Harris.
W. H. Jordan.
M. A. Scovell.
A. C. True.

The report was accepted and the committee was continued[1] and instructed to prepare the exhibit.

H. H. Goodell. A recommendation came from the committee on collective station exhibit at the Paris Exposition that the exhibit when prepared should be a permanent one, that it be not broken up, and that the Secretary of Agriculture be requested to provide a proper place for it. The executive committee report in favor of adopting this recommendation.

On motion, the recommendation was adopted.

Adjourned until evening.

Evening Session, Tuesday, November 15, 1898.

The session was called to order by Vice-President Alston Ellis, of Colorado.

C. S. Murkland, of New Hampshire, for the committee on engineering experiment stations, presented the following report:

Report of the Committee on Engineering Experiment Stations.

Your committee fortunately was simply charged with the duty of furthering the interests of the proposed measure. Our instructions did not demand that we present the matter before Congress immediately and urgently. Under the discretionary liberty thus provided for, it was deemed wise not to press the issue at the last session of Congress. Other measures of importance to the colleges had the precedence and there was something more than a doubt as to the possibility of securing favorable action. Your committee therefore reports that the proper time has not yet come for urging before Congress the wisdom of establishing engineering experiment stations.

On the other hand, the outlook is more favorable now than it has been before. The recent events which have emphasized the value of mechanical training and have shown how intricately the national welfare may be involved in the mastery of mechanical principles, as at Manila and Santiago demonstrate the ultimate economy of institutions wherein such mechanical knowledge and skill may be developed.

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[1] For action of Minneapolis convention see U. S. Dept. Agr., Office of Experiment Stations Bul. 49, p. 43.

It is therefore recommended that this committee be continued and instructed to act in cooperation with the executive committee and under its direction.

That the executive committee be instructed to urge this matter upon Congress at the earliest expedient moment.

That the proposed bill be so amended as to permit investigation in marine engineering, naval architecture, and the theory and use of projectiles on land and sea.

Respectfully submitted.

C. S. MURKLAND, *Chairman.*

On motion the recommendation of the committee was approved and adopted, and the Chair continued the same committeee to act in conjunction with the executive committee.

The report of the committee on nomenclature was read by H. P. Armsby and referred to the Section on Agriculture and Chemistry (see p. 117).

The report of the committee on uniform fertilizer laws was read by H. J. Wheeler and also referred to the Section on Agriculture and Chemistry (see p. 112).

A. C. True, bibliographer of the Association, read the following report:

REPORT OF BIBLIOGRAPHER FOR 1898.

Since the last annual convention of the Association your bibliographer, in connection with his duties as Director of the Office of Experiment Stations, has promoted work on the bibliography of agricultural science in several directions.

(1) Under his direction there has been prepared and published a list of over 400 books on agriculture and related sciences, most of which were published within the past two or three years. This list has been issued as Circular 38 of the Office of Experiment Stations and is supplementary to Circular 31.

(2) As preliminary to some work on irrigation which the Department of Agriculture is undertaking in cooperation with the experiment stations, a bibliography of the literature of irrigation has been prepared in the Office of Experiment Stations.

(3) A list of the periodical literature (outside of the experiment station publications), on which the Experiment Station Record is based, has been prepared and the abbreviations used in that journal have been carefully revised and systematized. As the Record contains references to nearly a thousand different publications broadly classed as periodicals, this has been a work of considerable magnitude and difficulty.

(4) In connection with the Digest of Metabolism Experiments, published as Bulletin 45 of the Office of Experiment Stations, a very large number of references to the literature of the subject have been made.

(5) A review is being made of the literature of the botany and chemistry of corn (maize), which it is hoped to publish before long, and the current bibliography of dairying is being kept up by Dr. E. W. Allen, with a view to continuing the review of this subject as begun in the Experiment Station Record.

In its bibliographical work the Office of Experiment Stations has the cordial cooperation of the Librarian of the Department of Agriculture and his assistants. Bibliographies of special subjects connected with agriculture are being made under the direction of the Librarian. The following have been published recently: References to the Literature of the Sugar Beet, exclusive of works in foreign languages, Library Bulletin, June, 1897; A Bibliography of Poultry, Library Bulletin, October, 1897; Reference list of Publications relating to Edible and Poisonous Mushrooms, Library Bulletin, January, 1898; List of Publications Relating to Forestry in the Department Library, October, 1898.

Other recent bibliographies published by the Department of Agriculture are:

THOMPSON, G. F. Index to authors, with titles of their publications appearing in the documents of the United States Department of Agriculture, 1841 to 1897.

THOMPSON, G. F. Index to Reports, Department of Agriculture, 1841–1897.

THOMPSON, G. F. Index to Reports of the Statistician of United States Department of Agriculture 1863–1894.

OSBORN, HERBERT. Literature relating to insects affecting domestic animals, United States Department of Agriculture, Division of Entomology, Bulletin 5, n. s.

HENSHAW, SAMUEL. Bibliography of the more important contributions to American economic entomology—concluded—1896.

A number of the experiment stations have recently published partial bibliographies of different subjects connected with their investigations. Among these are the following:

DUGGAR, B. M. Supplemental list of references to literature of some important pear diseases, New York Cornell Station Bulletin 145.

SLINGERLAND, M. V. Bibliography of some of the more important contributions to the economic literature of the codling moth, New York Cornell Station Bulletin 142.

MUNSON, W. M. Bibliography of the more important papers on the fixation of free nitrogen, Maine Station Report 1897, pp. 131–140.

NELSON, J. Recent literature on garget, milk fever, and bovine abortion, New Jersey Bulletin 127.

STURGIS, W. C. Literature of fungus diseases of plants. A provisional bibliography of the more important works published by the United States Department of Agriculture and the agricultural experiment stations of the United States from 1887 to 1897, inclusive, on fungus and bacterial diseases of economic plants, Connecticut State Station Report 1897, pp. 182–222. Also includes 100 of the more important foreign references relating to the subject.

HALSTED, B. D. Bibliography of American references to asparagus rust, New Jersey Station Bulletin 129.

PAMMEL, L. H. Partial bibliography of the Russian thistle, Iowa Station Bulletin 38.

In connection with the investigation on bread at the Maine Station a bibliography of the subject has been prepared with the cooperation of the Office of Experiment Stations.

The important manual on Feeds and Feeding, by Prof. W. A. Henry, of the college of agriculture of the Wisconsin University, contains numerous references to experiment station publications and other literature on this subject.

Some recent foreign works of bibliographical importance in connection with studies in agricultural science have been brought to the attention of your bibliographer. Such is the general index to the last 30 volumes (vols. 21–30) of Die Landwirtschaftlichen Versuchs-Stationen, issued by Dr. F. Nobbe and Dr. L. Hiltner, is a supplement to volume 50 of that journal. It includes author and subject indexes and occupies nearly 200 pages.

The late Prof. Friedrich Stohmann, of Leipsic, had in process of publication at the time of his death an extensive treatise on milk and dairy products. The book was issued a few months after his death under the title Die Milch und Molkereiproducte: Ein Handbuch für Milchtechniker und Nahrungs-mittelchemiker. It comprised over 1,000 pages. The discussion is based upon the investigations and experiments in milk and dairying, and is the most comprehensive and thorough treatise on the subject which has appeared in any language. The large number of references given to original accounts of investigations add to its value and contribute to make it a very useful and valuable reference book.

An interesting piece of work in another line is the "Bibliography of some anthracnoses," by Bertha Stoneman, Bot. Gaz. 26 (1898), No. 2, pp. 114–117.

In an address before the French Association for the Advancement of Science, Edmond Gain gave a bibliography of the United States Department of Agriculture and experiment station literature of the last two years on the foods and feeding of man and animals.

A recent American bibliography of importance is the following:

MACDOUGAL, D. T. Literature concerning the fixation of free nitrogen by plants; Minnesota Botanical Studies Bulletin 9, pp. 187–221. More than 600 references to literature are cited.

A. C. TRUE, *Bibliographer.*

The annual address of the president was then delivered by H. C. White.

PRESIDENT'S ADDRESS.

I desire at the outset of this address to give expression to the sincere appreciation in which I hold the kind partiality you have manifested in calling me to preside over your deliberations on the occasion of this your twelfth annual session. This appreciation has become the greater since, in reflecting upon the matter of an appropriate topic for this presidential address, I have been led to consider, with greater seriousness perhaps than ever before, the purposes, the past performance, and the future promise of your Association. Recalling the eminent men who, by your suffrages, have stood where I now stand; remembering what they and you have accomplished by your counsels and your labors; reflecting upon the potentialities which lie within your hands, and realizing the beneficent purpose of it all, I am moved to deepest gratitude for the honor you have done me in permitting me to figure as your leader for the current year.

These same considerations have led me to turn aside from special topics which have suggested themselves as appropriate for discourse on this occasion and have determined me to speak to you to-night of the Association itself; to review its purposes, to make clear, if I may, the magnitude of its potentialities, and to point out, with your permission, certain lines of special endeavor in which it may appropriately engage.

Something more than a century ago the first and foremost of the Chief Magistrates of this great nation, foreseeing the many difficulties and dangers which would attend

the working out of an untried experiment in free self-government by the millions of men, diverse in blood and heterogeneous in race, who should come to inhabit this vast continent, of myriad differences in climatic and physical conditions, emphasized in his counsels the importance of the speedy development of a suitable and uniform national character, which should give homogeneity to the separated masses of the population, and serve as safeguard to their mutual interests. Foremost among the agencies which he commended as instrumental to this end he advocated and materially furthered the founding of a great national university, a central seat of learning to which might come the selected youth of each community for intellectual molding to a common type, returning thence to impress the national character upon the peoples of their respective homes. Apparently unheeded for a hundred years, attempts are making in these latter days to respect the counsels of the great statesman and to erect a university of the form which he proposed.

Something more than sixty years ago the foremost of American philosophers, recognizing the unique forces at work in molding the intellectual life of the young Republic, and forecasting the splendor of the end they might attain, depicted the character and marked out the lines of development of the future American Scholar who should come to give direction to the nation's intellectual growth and illustrate it among the enlightened peoples of the world. For more than half a century the memorable picture painted by the great New England sage has fixed the type of scholarly aspiration in America.

But America has changed since the days of Washington; changed in such measure as even he could not have foreseen; changed radically in such manner that even he, could he have foreseen, would have modified radically the form of endeavor by which the purpose he had in view should be achieved. The rapid and enormous conquests over time and space made by American energy, American invention, and American skill are, of themselves, molding into homogeneity the heterogeneous elements of our population; the express train makes interests mutual which geography would divide, and the national life is daily tuned to unison by the newspaper and the telegraph. Our people are not separate, but one, and the scattered communities need not await the slow return of the scholar from his distant fane to exemplify and construct a national character common to the peoples of all the States. But although other factors potently contribute to the formation of a common character which shall possess the nation, Washington was wise and in accord with all the other wise of all the ages in the conception that upon the scholar is charged the creation and the illustration of the proper type of character however nationalized.

Learning—in its broad sense, intellectual and spiritual—determines for a people, as for an individual, the wisdom and the righteousness of thought and act. An institution of learning—or institutions of learning, animated by a common purpose—is necessary to the formation of the scholar; to perpetual preservation, in purity and integrity, of those possessions which constitute the scholar; to their proper distribution through successive generations. The essential functions of the university are of the essence of the eternal; they change not with changing times; they are the same yesterday, to-day, and forever; Barbarian, Greek, American, Cosmopolite—the same. To keep alight, amid all conditions of the body politic, the flame of learning; to hold fast to truth as known; to train the choicer intellects, that by their means the boundaries of knowledge may be widened and other truth attained; to bring home, through those it teaches, to all the people the knowledge of so much of truth as may be conquered, and the understanding of how it may be fitted to their daily lives—whatever form the university may take, these are its fundamental offices. And such, we may be sure, were to be the functions of the institution that Washington would found.

And America and the world have changed since the days of Emerson. Not that conception has changed the essential attributes of the scholar in the abstract. Man thinking he has ever been; Man thinking he still is and will ever be. Nor yet agreement as to the fundamental factors in his forming. Nature, books, action—which typified for Emerson original thought, knowledge of the thought of others, the use of thought—may still be conceded to be the potent trinity of forces in his building up and equipment. But the lifetime of the Republic has witnessed something more than the normal accretion to knowledge which comes with lapse of time, and the marvelous opening up, during the last half century, of new avenues of penetration to the abode of truth and approaches to the presence of the Supreme Thinker have modified our interpretation of the character of these forces and enlarged our understanding of their proper use. Nature was to the scholar of Emerson as a book that is sealed. Of the form and outward seeming only had he knowledge; of the marvelous beauty he was conscious, and of the grandeur he took account; but from understanding he was far removed. His communion with her was of no other quality, and scarce more intimate than that of those in ages past who set over the processes of nature as past man's comprehension and attributed them to wayward fancies of the minor gods. A fitting field for revels of the imagination, but barred—as it were by risk of sacrilege—to the searching out by human endeavor of a connected course

of cause and sequence, and thus incentive to the limitation of intellectual processes to that introspection which wrecks the reason as an intellectual force.

But nature to the scholar of to-day is something vastly different. The volume of the book has been unsealed and what is therein written been disclosed. The "reign of law" in nature has been made manifest and the legal processes reduced to code. Understanding of the processes is possible; searching out of the procedures is permissible, and the whole of the contents of the book are freely offered to man's investigation in exercise of his highest and noblest intellectual endeavor. The scholar of to-day can not, if he would, ignore the opening of the book. Even if inattentive to the truths which are revealed upon its every page; even if, absorbed in search of stimulus to abstract thinking, he is unobservant of specific beauties which stand disclosed, yet, if he would attune his mode of thinking to manner of the Great Intelligence, he can not be unconscious of those "thoughts of God" which are manifested in the great generalizations which we call nature's "laws." And so it has come about that the university of to-day is called upon—as in the days of Emerson it was not—in the training of the scholar, in the use of nature to his fitting out, to embody in its curriculum, as a necessary contributor to training in correct thinking, the study of the sciences—the "organized knowledges"—of nature, involving new methods in the investigation of truth and new manners in the imparting of information, the securing of knowledge, and the achieving of understanding, and employing a novel paraphernalia of apparatus, laboratories, experimental fields and forests, museums, and workshops as needful to that end.

This modern enlargement of our view of the function of nature in intellectual culture, this more nearly correct understanding of what nature truly is, the glimpse which, through nature thus understood, is afforded of the intellectual processes of the Intelligence which stands back of nature, has modified in another particular our conception of the scholar. The production of the scholar is not fortuitous; he is not born to the scholarly estate; not sprung full fledged from brain of Deity to adapt a divine equipment to human environment; not product of special creative act. Following the orderly course of other generations in the universe, he is an evolution; a differentiation from among his fellows; a survival of the best among a host. This changed aspect of the scholar has modified materially the conception of the university. From the whole race of men the scholar springs; within each individual intellect of the human race may lie his promise; no select class from which he shall issue may, from the beginning, be set apart by human choosing. The university, if it will truly serve its purposes, must, therefore, be an institution of the people, not an institution of a class; its endeavors must not alone soar upward to the crowning of the scholar, but, as well, reach downward for recruiting of material whence the scholar shall proceed.

Of all the branches of learning committed to its keeping none serves so well this function of the university as the natural sciences. Touching the people, even the most humble, nearly and acceptably by the contribution of their applications to daily needs and comforts; potent factors in the satisfaction of material desires which must be reckoned with in advance of culture, they quicken intellectual aspirations among the masses of the people and open tempting avenues to intellectual growth which otherwise would be barred, unpassable, and unattractive to millions of the youth. Happily, the world at large has come to appreciation of certain fundamental truths embodied in the American Declaration of Independence, and to recognition of not only the usefulness but the necessity of the training of science to the production of the scholar, and you may conceive it a waste of energy at this late day to engage in even the appearance of argument on the subject. But there are still unbelievers among the principalities and residuary legatees of ancient doubts among the occupants of high places. Only a few months ago one of the most distinguished professors of one of the foremost of American universities declared it as his conviction that the higher learning should be reserved as the possession of an exclusive class, and deprecated the introduction of the natural sciences into the university curriculum lest, perchance, "the perfume of the Attic violet should be stifled by the stench that rises from the chemist's crucible." The perfume of the Attic violet, forsooth! Where blooms to-day in richest fragrance the flower of ideal culture save among the peoples whose institutions have made free and whom the works of science have made strong and great? Does not our brother reflect that when Homer—that heroic figure dear to every cultured heart—"the blind old man, sitting by the Ægean Sea, tuning his harp to the murmurs of the waters that rippled round the isles of Greece"—when Homer invoked his tuneful Muse she brooded over the nations, the vast majority of whose peoples were steeped in intellectual darkness and barbaric woes; and Homer was as a myth, invalued to the world of Greece, and only become an inspiration to the intellectual life since the might of science struck shackles from the thoughts of men. When Phidias wrought his immortal works the glories of the Parthenon crowned the Athenian hill, at the base of which groveled millions of men in servitude to ignorance; untaught, unkempt, in semi-savagery, lacking the elemental comforts of daily life, whose miseries the reflected

splendors of the Acropolis could do naught to assuage; and art-expression of the beautiful—served but the superstition and the vice of men till Science came to lead it in paths of recognition of the good and true.

Believe me, there is no question here of stifling any perfume which may make glad the hearts of men or find acceptance in the sight of God. But if the dainty violet will persist in blowing not elsewhere than on Attic soil it may very well come to pass that deficiency of nutriment in oft-tilled ground will unfit it to compete in sweet exhalations with more sturdy flowers which transmute the chemist's stench to savors goodly in the nostrils of gods and men.

As to books. Culture is still achieved through acquaintance with the "best that has been thought and said in the world," but the enlarged vision of the last half century has discerned an enormous broadening of the "humanities" which go to constitute the ideal culture, and would place Newton and Darwin and Joule and Herbert Spencer and a host of others from among the men of science beside Plato and Homer and Goethe and Shakespeare, as of the class of the thinkers and sayers and doers of the best things which man has compassed in his search after truth.

But it is in the field of action that actual and prospective revolution is most apparent in the processes of the formation of the scholar. As energy without purpose is not industry, so activity without purpose is not action. As Emerson foresaw, the future scholar, particularly he who should come to illustrate the great Republic, might not be a recluse, a bookworm, a solitary dreamer; he should be filled with the vigor of the young and lusty nation, in intimate touch with and a part of the abounding activities of the nation's life. But Emerson did not clearly foresee that the scholar might be contributory to these activities as well as inspired by them. And yet he dimly perceived that otherwise the scholar might not be type of the complete and perfect man, for, as he elsewhere deplored, the self-satisfied "arrogance of the practical man," proceeding from consciousness of his power in accomplishment, set over in hostile array against the disdainful "arrogance of the scholar," born of his contemptuous lack of understanding of the activities which such accomplishment involved, must necessarily produce the skeptic and the cynic as the logical result of such estrangement and the highest type of the man thinking possible in consequence. In the light of history as known to him Napoleon Bonaparte typified for Emerson the man of action. War, the conflict of man with man for possession of territory, the enthronement of an idol, the propagation of a faith, social or religious, seemed most active agents in the progressive upbuilding of the nations and the field of action best suited to the excitation of intellectual vigor.

But it is not so now; it has not been so in the days succeeding Emerson. The marvelous multiplication of the arts of peace, the immense and keen activities which they employ, the splendid civilization to which they have given birth, and the wonderful intellectual achievements which have borne them company give ground for faith and reasonable hope that within these, perhaps, may proper place be found for activity needful to the development of the scholar. The "scholar in politics" has already come—albeit of but small approximation, in many cases, to a high ideal. May we not expect and hope for the coming of the scholar in the industrial arts. Herein lies a field of endeavor rich in promise for the university in its search for schools in which the scholar may be trained to action. The industries whose fruits satisfy the material needs of man, which, if you please, accumulate his wealth, which regulate his commerce and direct his trade, are no longer exclusively or best served by the unremitting muscular energy of toiling millions, nor yet by high efficiency of manual skill. They have come to involve in their prosecution intellectual abilities of the highest order, and become not only thereby fit occupation in activity for him who is to be the scholar, but, indeed, unremunerative and unadapted to those lacking some part of scholarly training. That training wherein nature is involved is, of course, here particularly affected. The pure sciences, as they are called, have fought their way to recognition as suitable factors in scholarly development. But even men of science have been inclined to look askant upon the "bread-and-butter sciences" as of doubtful fitness to the making of an intellectual man.

In this direction, it seems to me, will come the next great step in the establishment of the conditions best suited to the development of the American scholar. The signs of the times are most propitious. Men who have given birth to ideas which must indelibly impress all future concepts of ideal culture; men who have thought thoughts which are recognized as the common possession of the human soul; men who have formulated some of the most brilliant generalizations of pure science, have sprung from the ranks of the industrial workers. I have it at first hand from a distinguished German philosopher—himself not a worker in the natural sciences—that, in the opinion of many continental thinkers, some of the publications of our own American Department of Agriculture, a department dealing professedly with the applications of science to the industries of the people, are worthy to rank as an intellectual stimulus with the publications of the most "learned" of learned societies.

We have recently been called upon to mourn the death of the great Englishman who was first to grasp that marvelous bit of truth which gave to chemistry the

"Periodic law," yet Newlands was exclusively a worker in the industrial arts, and the man thinking while busied about the processes of sugar production.

A few weeks since the British Association for the Advancement of Science was presided over, at its annual meeting, by Sir William Crookes, a man who has achieved the highest renown as an investigator in the domain of pure science; who, by his researches upon radiant energy, paved the way to those recent brilliant discoveries which threaten to transfer the field of our search after truth from matter to the immaterial essence of the ether; a man transcendental beyond our own great transcendentalist, for he is also president of the Society for Psychical Research; idealist no less than materialist in his endeavor to grasp the unity which lies within the diversity of the universe, for, in the course of the address to which I shall refer, he claims for ether vibration powers and attributes sufficient to account for the transmission of thought, and likens the structure of brain and nerve to that of the "coherers," familiar to students of wireless telegraphy. Nevertheless, this man on this occasion, where precedent required that the best thought which science had to offer to the world should be presented, devoted the greater part, almost the entirety, of his presidential address to a statistical review of the present conditions attending the production and consumption of wheat—the food staple of the world—in order to emphasize the urgent and immediate need of such further conquests by science over nature as should guard our future populations from actual famine. Verily, the "bread-and-butter sciences" are wresting recognition from the scholars. The American university, which is to environ and form the American scholar, will find here a field of endeavor, rich in promise of fruitfulness, but almost virgin as to tillage. The intellectual training which shall best serve the application of intellectual power to industrial pursuits is not yet systematized—has not yet been given a satisfactory form to serve for pedagogic purposes. To give it such form, to fit it to the needs and the uses of the great masses of those who, in the nature of things, may not have other scholarly attribute than that of action, and at the same time suit it to the equipment of the scholar who shall be differentiated from the masses, is one high and important office of the American university which is to be.

I do not know, of course, that that which I have now in mind was in the thought of that great American of our day—the statesman-scholar whom we especially delight to honor—but the more I study the formal enactments whence the educational institutions forming this Association derive their being, the more I reflect upon the spirit which lies within the substance of the law, the more clearly I perceive the possibilities which are involved, the more I am impressed with the conviction that Morrill has here wisely laid an appropriate foundation for realization of the dream of Washington and prepared a proper way for the coming of the scholar of Emerson; that within these great national schools lies the germ of the national university, which shall be worthy and befitting the great nation which gives it birth. With a bias, it is true; with an emphasis for education of a specific character; with a postulate concerning their "leading purposes;" but therein lies their unique merit and the assurance of their suitability to the purpose, for it is fitting that America, the most modern of the great nations of the world, should be foremost in trial of new methods holding promise of usefulness in the training of the scholar.

Here we have not one institution but a great number of similar institutions with oneness of purpose; not one temple of learning to which may come a few of the choicer intellects of diverse and separated commonwealths, prepared by diverse methods and to diverse degrees, or not prepared at all, to be touched with the coals from off the altar of higher learning, and to carry thence, it may be, a flickering and uncertain spark of sacred fire; but many temples, each with its altar on which is kept alight the self-same and eternal flame in the face of all the people; differing in nonessential details with differing environments, but essentially alike—one and the same institution in methods and in purposes. These institutions are endowed—rather, I would say, this institution is endowed—with all the proper functions of the university, and hold within them all the necessary agencies which go to mold the scholar. Colleges in fact as well as name, they are given custody of the highest learning and charged with its preservation in purity and integrity. They are commanded to disclose to those they teach the whole of nature so far as known and the truth of nature as known. They are required to employ in their curricula the agency of books, to utilize the whole of existent culture in their educative processes, and to that end are not only permitted to include, but are expressly enjoined not to exclude, any branch of learning which may contribute to scholarly development. Provision is made for the prosecution of the search after truth—the extension of the boundaries of knowledge—in the experiment stations, which are integral parts of the educational establishments.

True, additions to knowledge are sought in a special direction, but the methods of research employed and the training incident to their prosecution are applicable in all similar fields of intellectual endeavor. They are provided with facilities for the publication and dissemination of new knowledge as it may be freshly acquired.

Above all, they are commanded to so shape their courses of instruction in the acquisition of knowledge and understanding that the field of action for those whom they train shall naturally, logically, acceptably, and efficiently be found in the peaceful industrial occupations of the people—a field hitherto but little used to such intent, but full of rich promise for both scholar and people as a theater of intellectual activity. They are placed among and not apart from the great masses of the people that the plastic material whence the scholar is to differentiate may include the whole intellect of the nation and shall itself be full and fertile. And they are so endowed materially that neither poverty nor riches may distinguish among the peoples whom they serve within the limitations made necessary by present conditions. Could anything be added; could better form be given to an institution which should be the basis of the ideal American university, suited to development of the American scholar and fitted to the genius of the American people?

President Eliot, of Harvard, sees no good reason why the national acts of endowment of these collegiate institutions should be so specific in their references to industrial occupations. I might agree with him did I conceive that such reference limited the functions of the colleges to the development of increased skill in our "hewers of wood and drawers of water." Trades schools and systems of apprenticeship have served this purpose in the past, and been condemned as unsuited to the intellectual and material growth of a free people. But I do not so understand their mission. Their foundations are broad enough to serve the development of any form of scholar. I do not underestimate the immense value to the nation and the world of the scholar possessed of any kind of culture—the man thinking, absorbed in abstract thought and closeted with the dusty tomes of ages, or the man thinking, aflame with energy and quickened to activity by contact with the forces which serve the avocations of the people—but I do believe that the provisions which relate these institutions so closely to industrial occupations are wisely drawn in interest of both the scholar and the people. The justification of the appropriation of public moneys to purposes of higher education is the admitted necessity that, for the good of the people as a whole, learning and scholarship should be maintained among them. I entirely believe the justification would exist if the result of such education were alone the production of a few scholarly men who should be qualified leaders of the people. But the justification becomes the more apparent, particularly in forms of government like our own, designed to serve "the greatest good of the greatest number," and in which moneys are taken from the people for governmental purposes only with their free consent, if the educative processes employed to form the scholar are of such character that at the same time and of necessity they serve immediate needs of the great numbers from whom the scholar is differentiated but who, themselves, will stop far short of full scholarly equipment. Such, as I have pointed out, I believe might appropriately be the character of the processes employed in any ideal modern university. Such are the processes actually employed in the institutions we represent.

It is quite clear to my mind that the benefactions which founded these institutions were not a gift of the nation to the several States; they were a distribution among the States of a national trust. Several parts of a single whole, organized with oneness of purpose, charged with prosecution of a common work, it may reasonably be assumed that it was expected that they should be in close and constant contact with each other, that unity in general methods might insure unity in object sought to be attained. True to the traditions of our peculiar form of Government, no central authority was instituted to control or supervise the operations of the colleges in the several States. Of themselves and through their self-appointed representatives only can they reach agreement concerning uniformity in methods which shall serve their common purpose. This Association, gentlemen, is the body of such representatives, and our councils should be animated, it seems to me, by a sense of our responsibility, not only to the particular college or station which we represent, but to the great national institution of which the colleges and stations are but parts.

Gentlemen of the convention, if the view which I have taken of the true meaning and the weighty responsibility of our membership in this Association commends itself to your approval, I am sure you will pardon me if I venture to suggest certain specific matters of detail concerning the work of the Association, which may perhaps be worthy of your consideration, as helpful to accomplishment of its high purposes.

First. To no roll call of the meetings of this Association should any single college or station entitled to representation therein fail to make response. The combined wisdom of all these institutions is none too great for proper determination of the weighty matters which should occupy our deliberations. Entire fulfillment of duty to State and nation on the part of each institution requires, it seems to me, attendance at these annual gatherings, where matters of supreme importance and mutual interest engage our attention. I would respectfully suggest that the Association put forth every effort in its power to impress upon the individual institutions the importance of participation in the councils of our annual conventions.

Of the matters engaging the attention of the Association at its annual meetings,

first and chief place should always be given to discussion of the pedagogic methods employed in the colleges and in the correlated work of the colleges and stations. I have stated my belief that within the applied sciences, within those branches of learning related immediately and intimately to industrial pursuits, may be found pedagogic material suited not alone to the training of the industrial masses but, as well, to the proper development of the scholar. The emphasis laid upon these branches in the acts of our endowments makes it our especial care to ascertain and establish their pedagogic value. Indeed, upon no other body of educators in the world does so much of responsibility lie for the tillage of this promising and comparatively virgin field of scholarly development. It is very proper and eminently desirable that the several specialists in our schools and stations should take counsel of each other concerning special lines of scientific and other work in which they are particularly and individually interested, but I submit that such matters should be subsidiary to the main purpose of the Association. If time can be found for them at the general meetings, economy and propriety would approve their introduction. If not, they can more profitably find place in other and independent associations of specialists. I would further respectfully suggest that much good in general and special lines might follow the occasional independent meeting of subassociations of colleges and stations grouped geographically, perhaps, or by similarity in character and object of special lines of work.

Again, I think we should remember that we shall not be expected to do all the educational work of the nation; that our institutions, though somewhat peculiar in form, have nevertheless the same great general purpose as other educational establishments—the sound and proper education of the people. This Association should therefore keep in touch with other educational bodies, and I respectfully suggest that we cultivate sympathetic and cordial relations with such organizations that we may not seem to stand apart as a peculiar people, but secure general recognition of the universality in value of the results of our endeavors.

A few weeks ago some of us had the great pleasure to listen to the admirable address delivered before the American Association for the Advancement of Science by the distinguished president of one of the foremost of our great institutions of learning, in which a lesson was drawn from the demonstration, during the recent war, of the marvelous resources of the nation, concerning the utilization of these resources in times of peace. Among other things it was shown that the amount of money employed in building and equipping even a fourth-class vessel of the Navy or to keep in commission upon a war footing for a single year a single battle ship of the first class, was rather more than the amount paid annually out of the public treasury for the maintenance of all our colleges and all our stations; and that the amount voted by the American Congress, without a dissenting voice and with the full and enthusiastic approval of the American people, to be expended within a few weeks' time, merely to prepare the nation for a prospective war to be waged for purely humanitarian sentiments, was approximately equal to that now set apart by existing laws for the maintenance of all our colleges throughout the period of half a century. Wonderful is the wealth of this great nation; marvelous its ability to fill its treasury to overflowing without hardship to the people; quick, generous, and without dispute its response to calls which appeal to its chivalry, its sense of justice, or its charity. The ability and the readiness being proven, can we doubt that, upon proper appeal, the nation would be less willing to make liberal provision for agencies which, in time of peace, contribute to its prosperity, its happiness, its righteousness, its fame, than, in time of war, to manifestations of its pity or humanity? This Association should take advantage of the teachings of the past few months to move the people's representatives to increased and more generous provision for the maintenance of these national institutions of learning which are related so closely to the welfare and the honor of the nation.

There are some pursuits more or less industrial; some avocations and professions apart from the strictly legislative, judicial, and executive functions of government, in which the governments of States and nations must and do, to some extent and of necessity, engage. The Army, the Navy, public works, scientific and diplomatic bureaus, require the services of well-educated and specially trained officials, the number of which is constantly increasing, and which in the near future will probably be largely augmented because of conditions arising out of recent events. Our colleges and stations are specially adapted to the training of men for discharge of these important and technical public duties. This Association might wisely urge upon the proper authorities the propriety and the desirability of taking due advantage of this admirable field offered for the recruiting of the public service.

Efforts are afoot in several directions to make available for purposes of education the necessary concentration at the capital city of the nation of much valuable material and many eminent specialists connected with the work of the Governmental bureaus. It seems to me a logical outcome of our system of national colleges and stations that such educational factors in the routine work of the National

Government should be placed, first of all, if not exclusively, at the disposal of these national institutions. As a proper step in this direction I regard as eminently wise and most promising in fruitfulness of results the action taken by this Association to ascertain through committee the extent to which the scientific and other bureaus of the National Government may be made available for graduate work of our colleges. This, indeed, would be the fitting capstone which would complete the grand edifice of our national university.

There is one other thing which I know it is expected I should say on this occasion, and it is proper I should say it in this connection. As I have endeavored to point out, the formal acts creating our colleges, the spirit which lies back of the letter of the law, the character of the work in which they are engaged, and true appreciation of the importance of that work all indicate that they are designed for and should be animated by oneness of purpose. To the several States which share the administration of this great national trust there is left, it is true, the determination of the "manner" in which the trust shall be executed, but it surely was not expected, nor is it permissible, that the "manner" should be in conflict with the purpose. With the division of responsibility as it exists there is always danger that misconstruction or misunderstanding of the purpose may lead to faulty or unwise manner of administration. Differences in nonessential details of administration there may very well be—doubtless there should be—with differing local conditions, but these should not be so magnified locally as to obscure or depreciate the importance of the great essentials in administration requisite to attainment of the purpose of the institutions.

It has happened in the history of our colleges and stations that zeal in individual instances for nonessential features of administration, justly, no doubt, considered of great moment in the particular case involved, have magnified these features to the proportions of essentials, and the work of other individual institutions has been thereby embarrassed and their interests compromised. This, I respectfully submit, is not as it should be. Each college and station should recognize the fact that different conditions may and do so surround the others that details—not of the essential—of administration best suited to the one may be not best suited to another, and should be chary of proclaiming, as has sometimes been done, I regret to say, in terms so emphatic as to approach the offensive, that form and substance are so intimately related in these institutions that unless a particular form advocated be adopted, there can be no real substance, thus exhibiting to the world an appearance of strife and contention where there should be (and doubtless is, at bottom) harmony and mutual respect.

It seems to me it might very well be within the province of this Association, having, first of all, clearly apprehended for itself the great purpose of these institutions, to define the essentials of administration appropriate thereto and to set them apart from nonessentials, to make these known in all localities where the institutions exist and to endeavor to so influence public sentiment in the several communities that, whatever may be the manner employed, genuine accomplishment of the purpose may be assured. Even beyond this the voice of this Association may appropriately extend. Our institutions can not hope in all cases to escape the blighting touch of those evil agencies which, some say, are inherent in all democracies and which, under cover of liberty in matters of administration, would thwart the purpose of the institutions and pervert them to other ends. The politician (in the meaner sense), the demagogue, that entertaining individual known to the vernacular as the "crank," may seek to use these, as they sometimes succeed in using other public institutions, to further objects incompatible with their proper purposes. Or, again, it may happen that contending political parties, advocating opposite or peculiar views concerning governmental policies, may reach so keen rivalry that the colleges may become involved and with the ascendency of one or the other party the peculiarity of its tenets be sought to be imposed within the teaching of the institution. Surely we will all agree that politics—in the sense of party contentions concerning policies of government—has naught to do with the business of education of the college which is to equip the youth with knowledge and train him in understanding so that when he shall have reached man's estate he shall correctly choose, as he shall be free to choose, among rival policies which may then be advocated. The college should therefore be free to pursue this business and this business alone, untrammeled by the political ideas or convictions which may seem ascendent for the moment. Politics—in the ordinary, lower sense—or anything pertaining to politics should have no place in the college or its management, either in legislature, board of control, board of trustees, or faculty. True it is, that party contentions of the time may involve the very fundamental and elementary principles of political science or sociology which necessarily form a part of the teaching of the college, but the conscientious and faithful teacher (and none other should find a place in our institutions) may be safely trusted to present the truth and the whole truth involved in the contention, for one side or the other of the controversy.

In the great majority of cases where such abuses of the uses of the college would

arise the abuse would probably be but temporary and find correction in the sober judgment of the community in which the college stands so soon as the abuse and its attendant evils were made manifest. I can not think it would be inappropriate, however, or improper for this Association to contribute to that manifestation; and this it could do by defining clearly the purposes of our institutions and scattering the definition broadcast. Surely the people and the representatives of the people of any State would listen to an appeal from us, the representatives of all the States, for the preservation, in purity and integrity, to its high purposes and its legitimate uses of this sacred trust committed to each and all. There is no suggestion here of an interference which may seem illegal or impertinent. But if there were! I do not forget that I am a citizen of one of the plural United States; I do not forget that the State from which I come has resented in blood and tears an interference by her sister Commonwealths in what she knew to be her inherent privilege; and yet I say it—for I was born a slaveholder; I have seen it manifested through bitterness of strife and anguish of spirit; and I have lived to rejoice that it is so—that the enlightened public opinion of the nation, the convictions and the determinations in public policies, born of a deeper knowledge, and a firmer grasp of the spirit which dominates the progress of the world, should and will prevail against peculiar local opinions in antagonism thereto, even though these should be held in undoubted honesty and cherished as the fondest convictions of the soul.

This Association is, or ought to be, the embodiment and the custodian of the national conscience and the national wisdom in matters concerning the interests of these national institutions.

If, fellow members of the Association, we are but wise in understanding of the great work in which we are engaged; if we are brave to grasp and strong to hold the opportunities which are presented to our hands; if we are faithful to the trust which is committed to our keeping, may we not, reasonably and confidently, cherish the pleasing expectation that in the future years there shall come forth from the courts of these temples of learning, from the halls of these schools of instruction, from the workshops of these establishments for research, from this university of the nation, our thousands of lusty young Americans, disciplined in intellect and sturdy in powers, who shall impart such intellectual energy to the industrial avocations of the people that the material civilization which they shall achieve shall transcend in quality, as it shall transcend in splendor, all other civilizations which the world as yet has known; our hundreds who have learned how, and do not shrink to dare, to tread fearlessly and firmly the paths which lead beyond the realms of staler knowledge to conquer such goodly domains of newer truth as shall glorify America and bless the world; and with them shall come, as fitting companion of their toil and choicest product of their common labor, nurtured by nature, learned in lore, associate in the glorious achievements of the great Republic, the American Scholar, to take his proper—perchance the chiefest—place among all the other scholars of all the nations and all the ages.

G. W. Atherton. We have all listened with very great delight to the noble and inspiring words of the address just closed. It seems to me it embraces some suggestions in respect to the future policy of the institutions represented in this Association which might possibly be formulated in some way. If it be not contrary to the sense of the Association, I move that a committee of five be appointed to consider and report some practicable method of putting into effect, or at least of formulating for effective use, the suggestions of this address.

The motion was carried.

In conformity with the motion the Chair later announced the following committee: G. W. Atherton, of Pennsylvania; J. E. Stubbs, of Nevada; R. H. Jesse, of Missouri; E. A. Bryan, of Washington; and J. K. Patterson, of Kentucky. For the report of this committee, see page 74.

I. P. Roberts. We have present with us this evening Hon. James Wilson, Secretary of Agriculture. It would seem most fitting that we should hear from him on this occasion.

At the request of the Chair the Secretary of Agriculture spoke, as follows:

Address of the Secretary of Agriculture.

Mr. Chairman and Gentlemen: I did not come here for the purpose of speaking to this convention, but merely to get my share of the president's address. Nobody has enjoyed more than I have the beautiful thoughts expressed by our worthy president this evening. There will be a wonderful contrast between my remarks and those of my eloquent friend. I have to deal with those branches of work which will bring money to the farmer and enable him to send his boys to college.

In the Department of Agriculture we have been busy during the last year working along the same lines which you are pursuing. There are many things perhaps which might be said regarding this work of the Department in which you would no doubt be interested.

In the first place, I have endeavored to bring the Department into sympathy with the agricultural colleges and experiment stations to as great an extent as possible. We have had marked success during the last year in some of our work. For instance, the operations of the Weather Bureau, designed for the benefit of men on sea and land, have been extended to the Caribbean Sea in order that we may warn vessels of our navy and our merchant marine of the approach of cyclones from the south. We had perfected our arrangements before any hurricane came this summer and we were able to tell everybody interested when the first one would come. So perfect has the science of weather forecasting become that it is now impossible for any hurricane to reach the United States from that direction without being heralded throughout its possible course, which is laid down with a great deal of accuracy.

The Bureau of Animal Industry has made some notable progress along scientific lines, as a consequence of which animals south of the quarantine line and subject to the diseases of that region can be dipped and taken north at any season of the year in entire safety to the northern herds. We are now sending cattle north by thousands, so that, instead of southern men being able to send their herds up to the feeding grounds of the north during only one or two months of the year, they can now send them at all times. The benefit of this to the breeder and feeder is very great.

Work along the line of finding an antitoxin for hog cholera has been quite successful. We have been experimenting for two years with an antitoxin prepared in the Department and have had quite satisfactory results. Eighty per cent of herds numbering a thousand head have been saved, while 80 per cent of similar herds that have not been treated have died. The scientists of the Bureau have no doubt whatever that we have reached the beginning of the end of this scourge.

We have been sending people abroad into all countries and all climes to get seeds and plants which, when brought to their appropriate life zone in the United States, may be of benefit to our people. We have a man now in Russia finding the healthy grains that succeed with the Russian farmer; and we have a man in the Mediterranean finding fruits better suited to our southern climes than anything we now have—oranges superior to anything in California or Florida.

We have been shipping abroad thousands of tons of dried apples and apple parings for cider making. It is proposed now to bring here the ferment that gives the bouquet to the cider made over there, so that we can make the cider here and send it over there in much more desirable condition.

We have a man in the China seas to bring here better rice than any grown in any of the Southern States. Our rice is long and slender; it breaks up readily; it does not sell as high as the Japanese rice. So we have sent a man to bring here a couple of carloads of Japanese rice.

We are also seeking to establish agencies abroad where we can sell our butter. We can do better than we are doing just now with surplus grains. The great American, free and well educated as he is, is at present growing grains and feedstuffs for the Danish cow. And after the Dane gets our grains, he sells about $30,000,000 worth of butter every year in the British market. He sends it even to the China Sea. I think it would be much better if the American would make this product himself, and let the Dane find his cow feed wherever he can. I think the people of the United States can do better than prepare cow feed for any foreign country. So we have been endeavoring to find markets in foreign countries where we can sell first-class American butter. Since the agricultural colleges and experiment stations have applied science to the making of dairy products, they can now be made of uniform quality and shipped across the Atlantic. We are convincing the people abroad who pay high prices for fine butter that we produce it just as good butter as can be produced in Denmark or anywhere else. Our efforts in this line are being extended over all the world.

One of our scientists goes the 1st of December to South America, to the southern end of this hemisphere, to see what can be found in the way of grasses, grains, legumes, etc., and to establish agencies for the sale of American dairy products and other things that we are able to send abroad. Our efforts in these directions have only begun.

We pay about $8,000,000 a year to other parts of the world for little things like chicory, ginseng, and Bermuda lilies which, apparently, do not amount to much. It is like pulling my heartstrings to see Uncle Sam's money going in that way. So our Botanical Divison has been gathering special information along those lines. Chicory, which we imported to the amount of 16,000,000 pounds two years ago, is now being grown in Nebraska and Michigan and that money goes into the pockets of our farmers. We imported only 300,000 pounds last year.

Attention is also given to the Bermuda lily. Our people are people of taste. They will have Easter lilies, and we pay out a very large sum of money to gratify

our tastes in that direction. I have been inquiring into the production of those lilies in Bermuda. I find that the soil is light and that the people over there are destroying what soil they have, so that the plant in consequence becomes diseased. We have made importations of these plants and sent them down to Mississippi, Louisiana, New Mexico, and South Carolina, where some very able men are working along these lines.

We find that the date palm of commerce will grow in Arizona just as well as it will in eastern countries.

We have good reports from our sugar-beet experiment stations. We pay $100,000,000 a year for sugar. It occurred to us at the Department two years ago to begin extensive experimentation in regard to the production of sugar, and we are able now to tell quite closely where the sugar belt of the United States is or where the production of beet sugar will be most profitable. We get much finer results from analyses than they do in either France or Germany. And it is only a question of time when the American people will produce all the sugar they consume. There is no question whatever about our ability to produce it. Of course the question of labor comes in here, but Americans adapt themselves to new vocations with wonderful facility, and are very ingenious in devising improved machinery. All the machinery of the sugar mills is now made in the United States. It will take an investment of $200,000,000 to build factories enough to make the $100,000,000 worth of sugar—1,800,000 tons—that we buy every year. This industry will give employment to hundreds of thousands of our own people. It will make work for our carriers and business people of various kinds, and will save $100,000,000 that we now send abroad.

Since we began our experiment the number of factories has been doubled and their capacity much more than doubled. There are twenty places that people have told me about where they are awaiting the results of our experiments.

It has been a question with me whether you want us to import first-class sugar-beet seed for another year or not. If it is thought wise by you gentlemen connected with the experiment stations that the Department furnish you seeds for another year we will do so. I am so well satisfied of the ultimate success of the enterprise that we will not hesitate a moment to furnish you whatever you want along that line. We sent out 17 tons last year, and the reports all along the line are exceedingly favorable.

There are other questions to which I should like to call your attention—quite practical questions. Congress, as Dr. White has told us, is already making magnificent appropriations for what he is pleased to call this great National University. It is right we should have colleges where a boy can go after he gets through with the common school or the high school and receive an education in agriculture and the sciences connected therewith. But the difficulty is to get the farmer's boy into such a college to study anything of that kind. I have had some experience along that line. My friend, Professor Curtiss, of the Iowa College, and myself, eight years ago, had experience in regard to the Iowa Agricultural College, and we found only one boy who had come there voluntarily to study agriculture and sciences related to agriculture. I do not believe that you can have an agricultural college at all unless you are teaching these things. I do not believe that the teaching of everything else and leaving this out is carrying out the original intention of Congress. Professor Curtiss and I went among the farmers of Iowa and tried to induce them to send their boys to this college to take the four years' course. Our people were sending students to all the denominational colleges and universities of the land. The Iowa farmer in general has a big income, for the soil is rich, and he sends his boys and girls to college. But we had the utmost difficulty in getting any of them to come to our college. I understand, however, that something more promising is now being accomplished. The freshman year has 50 boys taking a four-year course in the sciences relating to agriculture.

The thought I want you to fix your minds upon is, How are we going to get the farmer's boy into the agricultural college? His father was not educated there; his mother was not. The family preacher was not. There is not in the neighborhood, so far as he knows, a doctor, a lawyer, or anybody else who was ever educated there. Scarcely anybody has a good word to speak for the agricultural college as a proper place for a boy to receive an education. A good many people who are drawing salaries from these colleges have scarcely a good word to speak for the education received there.

The other day as we were coming through Ohio and Indiana there was a man on the train who said to me: "We are very much interested here about getting nature studies into our common schools. Have you any advice to give us on that subject?" "Yes," said I, "teach the teacher in the common school and college. Until you do this, you will get nothing in that direction."

It did not occur, probably, to Congress when it made provision in 1862 for these colleges that while it might give money, money could not make a college. You must

have the proper kind of teacher. We meet with this same difficulty now. The boy in the common school and the high school is educated in almost every other direction than toward the agricultural college, and so we do not get him there.

I learn that our friend Professor Roberts, of Cornell, has been working along these lines, as he does along many valuable lines, and that he is sending out leaflets on this subject to the teachers. I was talking on this subject with President Silvester, of the Maryland Agricultural College, and he said: "I am going to get all the teachers of Prince George County to come to the college for a week or two to be educated on this subject, so that when they go back to their common schools they can teach nature studies, and the farmer's boy will have his head turned in the right direction—will get a bent toward his future life work."

The laws of many of our States require the superintendents of public instruction in the counties to get the teachers together and give them instruction with regard to their work. There is the place to meet the teacher of the common school and give him instruction in regard to these matters; instruction with regard to the soil and plants; the difference between grass and legume and grain; the difference between the deciduous and the evergreen tree; and something about the insect pests and about the friends of the farmer. Professor Hays, of the Minnesota Station, is preparing a series of school readers that will give instruction on these subjects. If the common-school teacher ever gets information on these questions, he or she must obtain it from the agricultural colleges; there is no other place where the teachers can get it. It is your province, gentlemen, to see to this matter, if you want the farmer's boy educated in this direction. Of course, if you want him to become a lawyer, a doctor, a preacher, a dentist, or something of that kind, he does not need to give any attention to these matters. There is no university for studies connected with agriculture. There are universities where a young man or a young lady can go and study science pure and simple, but economic science is taught scarcely anywhere. There is no work done in the Department of Agriculture that does not aim directly toward the man in the field. There is not one of us there who would have the conscience to draw a dollar of our salary if we were working along the lines of pure science. We are working all the time to help those who need help, and there are plenty of people in the United States who need such help. The Department of Agriculture, through its sixteen scientific divisions, is helping in that direction all the time. The chiefs of our divisions can take a few bright young men who have graduated from the agricultural colleges and direct their studies along the proper lines. Then such a student can specialize; we can put him into our chemical division or our physiological and pathological division, or our botanical division, or any other of our divisions. Thus he can get proper direction in his studies. Sometimes, perhaps, we may be able to allow such students enough salary to pay their board; that will depend upon the extent to which their services are needed. But something of that kind the Department of Agriculture can do; and I should be very glad to have the aid of the wisdom and sympathy of this Association in trying to put such a scheme into practical operation.

The system of feeding, the preparation of beef, pork, dairy products, poultry, etc., for market is now quite well understood. A very great many of our farmers procure and read everything that can be found in print on these subjects. They know they can not fatten an animal on wheat straw. They have discovered this and a good many other useful things. This is the kind of information you gentlemen are giving them in your farmers' bulletins.

The knowledge of how to compound rations so as to produce the best results makes the difference between prosperity on a farm and total loss—and there are a great many total losses. A great many people give up their farms saying they do not pay, and they go to town, where they become nuisances. Every farmer who takes up his residence in town is out of place. He is generally opposed to taxation, opposed to lighting, opposed to proper water supply, etc. He stands on the street corner and whittles. The farmer ought to stay on his farm.

Our people are learning very rapidly the proper feeding of animals, but we are not doing a very great deal yet in the direction of feeding ourselves. Dr. Atwater went down South to study nutrition among the laborers of the South, and he found them in one locality eating molasses and corn bread and fat pork. He suggested to them that they grow beans and peas and buy cows. That was not a very original suggestion, but those people had not thought of it before. Our mothers and our cooks are to be educated. If a young man, after attending an agricultural college, comes home with his diploma, having acquired a knowledge of compounding rations for horses and cattle, why should not a girl come home from college with a knowledge of feeding the baby and feeding her younger brother and feeding her father?

If it is necessary to organize colleges in order to study and teach the proper feeding of horses and cattle, why should we not give considerable attention to the feeding of mankind? One of our soldiers, complaining at the close of our recent war with Spain how badly he had been treated, said that he had not had anything

to eat but hard-tack. He did not happen to know there is probably no one thing known to man that comes so near being a perfect ration as that hard-tack. The ration of the United States Army is the result of long thought and experience of thoughtful men. The question comes up now, Should it be modified for the use of the Tropics, and if so how should it be modified? Questions of this kind come up all the time—the feeding of armies, the feeding of laborers, the feeding of all classes of people. We are doing something with these questions in the Department of Agriculture, and it is my impression that much good can be done by the cooperation of the experiment stations in investigations of this kind.

But I rose to speak only a few minutes. I am glad to meet you gentlemen here. I wish to say in closing that exceedingly great progress is being made at all the stations. There is more investigation at these stations than there used to be; there is less attempt to entertain us than there used to be and more endeavor to reach practical results by practical investigations. There is no "royal road" for the college or the experiment station to follow; there is no path blazed through the woods. I cordially indorse the meeting of the representatives of these institutions in these conventions. When we sum up the results attained, we shall find that one man has taught us one thing, one college has taught us another thing, one experiment station has taught us still another, and thus we shall eventually arrive at the best methods for teaching the farmer's boy and the mechanic's son in the beneficent institutions represented in this body.

Adjourned until the following morning at 9 o'clock.

Morning Session, Wednesday, November 16, 1898.

The convention was called to order at 9 o'clock by President White.

A discussion of the subject of the mailing lists for the experiment stations was participated in by E. Davenport, H. H. Goodell, Alston Ellis, P. H. Mell, and H. P. Armsby. As a result, the following resolution was adopted:

Resolved, That this Association reaffirms its former action and earnestly urges upon all stations the use of the mailing lists prepared by the Office of Experiment Stations.

E. Davenport, of Illinois, introduced the subject of detail of military officers to the agricultural colleges, voicing the general regret that the Government had suspended its detail of military officers as instructors in the agricultural colleges. Remarks were made by H. H. Goodell, Alston Ellis, J. W. Hestou, C. T. Jordan, A. Q. Holladay, J. S. Newman, E. A. Bryan, I. P. Roberts, and J. H. Worst. It was the general opinion that the institutions should be consulted and have the privilege of expressing a preference in these details.

H. H. Goodell reported that he had seen Adjutant-General Corbin and had been assured by him that as soon as practicable the military details would be again made by the War Department, and that they would be made on the same day to all the colleges.

The following motion was carried:

Resolved, That the matter of the detail of military officers by the War Department to the various colleges be referred to the executive committee with power.

The Chairman. The time has now arrived when, by invitation of the President of the United States, this body will proceed to the White House.

On motion of H. P. Armsby the convention took a recess to allow the members to pay their respects to the President of the United States.

When the session was resumed the Chair stated that according to the regular program the consideration of the proposed amendments to the constitution would be in order, but suggested that in view of the small attendance the matter might be deferred until the evening meeting.

On motion of I. P. Roberts the convention proceeded to a preliminary discussion of this subject with the agreement to defer action until evening.

The report of the special committee on revising the constitution (embracing the views of both the majority and the minority of the committee) was then read. This report was printed in the proceedings of the eleventh annual convention of the Association.[1]

[1]U. S. Dept. Agr., Office of Experiment Stations Bul. 49, p. 28.

The CHAIRMAN. Major Alvord, the chairman of the committee that submitted these propositions, is now present. He is no doubt prepared to explain in detail the reasons which influenced the committee in making these recommendations.

H. E. ALVORD. It is true that I have the honor of having written this report; but, after all, it is only a compendium of the opinions of a large number of gentlemen here present—members of the majority and minority of the special committee; and their conclusions were based upon a large number of letters and personal interviews. I think that unless there are specific questions to be asked there can hardly be a better statement made as to the main propositions themselves and the reasons therefor than that which appears in the report.

One thing does not appear here; and a statement of it might be enlightening to those who are to vote on these propositions; that is, the attitude of the special workers who meet now in sections, which, by this majority report, would be abolished. A suggestion has been made that it might be well to hear from those gentlemen who would be affected by these changes.

H. P. ARMSBY. The present organization of this Association in sections was made at the convention of 1889, in this city, nine years ago; and it so happened that I had, with others, some little hand in the discussion of that proposition. While I have the very greatest respect for the judgment and opinion of the members of this committee, nevertheless, even at the risk of writing myself down a Bourbon, I must say that I look upon the kernel of this question from the same point of view that I did then. The essence of the question before us, as I understand it, is whether the meetings of this Association shall be purely administrative in character or whether provision shall also be made in one way or another for the discussion of the technical questions relating to teaching and investigation in these institutions. The way of getting at this is a matter of detail; but that is the fundamental question before us for discussion—whether these technical subjects shall be included as a part of the work of the conventions of this Association.

If members of the convention will refer to the proceedings of the convention of 1889, they will see that while this proposition was then debated at considerable length, and while the original proposition as brought before the convention was very materially modified, and modified, in my judgment, to the very great advantage of the Association, the whole discussion practically was upon the question how to get at what we wanted. There was, I think—and I have read the discussion pretty carefully—substantial unanimity at that time in the feeling that it was desirable to provide in some way for the discussion of these technical questions. Speaking for myself—and I think I may say speaking also for others who are interested in their several lines of work—I should feel it a great misfortune if I could not have the opportunity of coming here and listening to the discussions of some of these questions which affect the actual everyday work of our institutions.

I have been a pretty faithful attendant of all these conventions, and my experience is that the discussion of these technical questions has been a great help to me—a great source of inspiration. It has helped me to get in touch with what other workers in the same lines were doing, and I have felt it a great stimulus in my own work. I should be very sorry, and I think that others who are situated like myself would be very sorry, to miss this opportunity.

It seems to me—and I am now expressing only my own judgment—that the system of sections as we have had it for the past nine years has on the whole worked well. I have not been able to see that it has seriously interfered with the executive work of the convention, and I think it has been a very great help to the institutions and the individuals represented in these conventions.

The majority of the committee give a number of reasons for thinking it desirable that this feature of the meetings of the Association should be dropped. One of these is the statement that the change proposed would enable the delegates, when they annually assemble, to give the entire time at their disposal and their undivided attention to subjects of paramount importance—that is to say, the various administrative questions which are indicated somewhat in detail by the committee. I do

not assume to speak with authority on that point, but I have not been able, I confess, to see from personal observation that there has been, as a rule, any serious difficulty in the past on this score. If there should be such difficulty in the future, I can see no reason why the executive committee should not exercise the discretion, which I understand it now has, of limiting the amount of time devoted to these discussions in the sections and assigning as large a proportion of the time of the convention to general discussion as it may deem necessary. I do not think that any gentlemen specially interested in these section meetings would raise any objection or would consider themselves in any way defrauded if the executive committee, for reasons which might seem to them good, should, when they thought it necessary, devote a whole day to the general discussions of the convention, cutting down correspondingly the time ordinarily allowed for the meetings of the sections. I can not see, therefore, that the question of time furnishes any argument in favor of discontinuing the present system.

The committee states: "If the sections are continued, the natural tendency will be to increase the number."

We started seven years ago with five sections in this Association; we have the same number of sections to-day. It is true they cover somewhat broader ground, but even if you consider this as an increase it has not been a very marked increase during the past experience of the Association.

I quote again from the committee's report: "If it is good policy to have any departments of colleges and stations represented by specialists, it is expedient and right that all departments should have equal opportunities."

I do not understand that the various departments of these institutions are in any sense *represented* in these sections. My conception of the sections is that they afford an opportunity for gentlemen who are interested in special questions to get together and discuss them.

The report continues: "Following this logical course, it will become more and more difficult than it now is to select and limit the attendance at these conventions."

Why should we "select and limit the attendance at these conventions?" Is there any reason why all the workers in these colleges, if it were practicable, should not attend these conventions and get the benefit of them? I certainly, as a station director, should be glad to have all the members of my staff here if their duties would possibly permit it. I do not see why anybody should be excluded. There are reasons, of course, why it is not practicable that all should come here at any one time; but I am unable to see any serious difficulty in the way of a representation in this matter. I can not see why an individual institution may not say that it will send its special delegates to represent it in the business sessions of this Association, and will send or allow to come as many more of its men as can conveniently do so. It is a matter for each institution to determine for itself, it seems to me, whether it will pay the expenses of these delegates, or will put them on exactly the same footing as the majority report of the committee proposes to put them when they attend the meetings of other associations. That is a matter, it seems to me, of internal policy for each individual institution.

One point more. I do not assume to speak for the gentlemen who represent the engineering side or the mechanic arts side of these institutions. I think I may venture to speak for those who are specially interested in the agricultural side. I think the general feeling among these gentlemen is very well expressed in that part of the report of the minority of this committee which states the belief that there do not exist satisfactory organizations at present for the discussion of these technical questions relating to agriculture. As I understand, the chemists and botanists and agriculturists of the institutions represented here do not come to the sessions of this convention simply as chemists or botanists or agriculturists, to discuss questions of pure science. The chemist comes here as the chemist of an experiment station; he is interested not in questions of pure chemistry, but in the applications of chemistry to the purposes of agriculture. In like manner the botanist, the zoologist, the biologist, come here to discuss the application of their sciences to particular

branches of agricultural industry. I am speaking of the agricultural side of our work simply. I do not know myself of any suitable organization where these questions could be discussed. The engineers have their organizations. Whether they meet the needs of the engineering members of these institutions I do not attempt to say. That is a question upon which they should be heard for themselves. But it does seem to me, Mr. President, that this Association would make a very serious mistake if it should cut out entirely, as I understand to be proposed, the discussion of these technical questions; that it would be missing a great opportunity to serve the institutions represented in the Association, and would be injuring itself by cutting out of its work and proceedings what seems to be a very important part—a part which is a source of inspiration for a great deal of administrative work.

What is all this administrative work for? It is not an end in itself; it is simply a means to put these institutions in good working order to handle these technical questions. Personally I feel very strongly that the Associatiou stands now, as was said nine years ago when this matter was under discussion, at a critical point. Suppose this convention should adopt the course of making itself a purely administrative body. On this point I am inclined to quote the substance of a remark made in the former discussion by a member of the Associatiou who, I think, is not now present, that if the Association limited itself to these administrative questions it would result in a "drying up" of the Associatiou; that this Association would simply meet in Washington occasionally, when it wanted to get something done by Congress. Of course that is an overstatement; yet I think there is a great deal of truth in it after all. It seems to me the Association, for its own sake and for the sake of the institutions it represeuts, should hold on to this technical side of its work in some way and in some form. I am not advocating any particular form just now.

J. B. Smith. Speaking for the entomologists, I will say that there is at the present time the Association of Economic Entomologists, to which practically every station worker, every professor who teaches entomology, and almost every entomologist who does any economic work at all, belongs. At the meetings of this association all the questions mentioned by the preceding speaker are taken up so far as they relate to entomology. We do consider the economic side of the question. We do cousider the methods of teaching the bearing of entomology upon agriculture. All these questions are considered. I think the argument set out in the report of the majority in the paragraph beginning "there are, however, other organizations of chemists, engineers, botanists, etc.," covers exactly the case of these entomologists. The great majority of the men with whom I have spoken on this matter, or who have written to me on the subject, feel exactly as stated here—that they would prefer to attend the meetings of the Association of Ecouomic Entomologists.

Furthermore, I have found, in writing to the entomologists of the stations and the teachers of entomology, asking them for titles of subjects to be presented at these meetings, that the majority of them stated it would be impossible for them to leave their institutions; that the president or the director intended to attend, and that the expenses of entomologists could not be paid out of the station or college funds; that they were unable to atteud at their own expense, and would not be sent as delegates. The result in this particular section has been that in the meetings held in the past there have been at no time more than half a dozen members in attendance, and those generally from near-by places, who could attend without any particular expense to the station or college. The entomologists are practically not allowed to attend these meetings unless they do so at their own expense.

For further discussion of the subject and the action taken on the amendment see p. 54.

R. H. Jesse moved that the conveution proceed to the next order of business; which was agreed to.

Mr. Jesse introduced a resolution regarding agricultural instruction in grammar and high schools; which, after some modification by the executive committee, was adopted, as follows:

Resolved, That this convention favors the introducing into public high schools and grammar schools of the several States of nature study and instruction in the elements of the economic sciences; and it is recommended to the colleges and other institutions concerned with agriculture and the mechanic arts that they endeavor to secure, if practicable, in their respective States such legislation or other action as may be necessary to introduce into the public schools the studies above named. For the training of teachers for giving instruction in these studies it is recommended that the colleges of agriculture and mechanic arts offer, if practicable, to teachers, in their summer vacations or at other appropriate times, courses of instruction in these subjects.

A. C. True submitted the following report of the committee on indexing agricultural literature:

Report of Committee on Indexing Agricultural Literature.

The committee on indexing agricultural literature have to report that they have had no meetings during the year, their deliberations taking place entirely by correspondence. In this way some progress has been made in formulating plans for the indexing. As a necessary preliminary one of the members of the committee, after consultation with some of the other members, has prepared a tentative scheme of classification for agriculture. This scheme is presented to you in printed form.

We would especially call your attention to the fact that this classification is designed to cover agriculture only and not such subjects as farm architecture, systematic entomology, and botany, or farm engineering. The scheme is designed to be used with the Dewey system of classification, which has been adopted in the majority of libraries in which any classification has been adopted at all. Of 63 colleges to which circulars were sent, 39 furnished replies, and of these 21, or more than half, used the Dewey system. The size of the libraries varies from 1,000 to 210,000 volumes, and the number of books on specifically agricultural subjects from 250 to 20,000.

The selection of books on agriculture to be indexed is progressing slowly. Some 200 have been catalogued.

The committee have thought best to authorize one of its members to prepare a tentative list, and to submit copies of this list to experts for suggestions, elimination, and additions, or alteration. The selection is not yet so far advanced as to justify the submission of this list. The committee, however, hope to be able to submit a carefully selected and annotated list of books at the time of the next convention. The scheme of classification is presented to the Association at this time in order that those interested may make such suggestions as they see fit.

A. C. True.
W. P. Cutter.
Thomas F. Hunt.
E. Davenport.

The scheme of classification follows:

Suggested Classification of Agriculture.

By W. P. Cutter, *Librarian of U. S. Department of Agriculture.*

630. AGRICULTURE:

- .01 Bibliography.
- .02 Compends.
- .03 Dictionaries.
- .04 Essays, lectures, addresses.
- .05 Periodicals.
- .06 Societies.
- .07 Study and teaching—
  - .071 General and public schools.
  - .072 Secondary schools.
  - .073 Colleges.
  - .074 Teachers' institutes and summer schools.
  - .075 Chautauquas.
  - .076 Farmers' institutes.
- .08 Official publications.
- .09 History, legislation, statistics.

630. AGRICULTURE—Continued.

.1 Economics—

- .11 Farm management—
  - .111 Laying out farm—
    - .1111 *Fields.*
    - .1112 *Farmsteads.*
    - .1113 *Roads and lanes.*
  - .112 Rotation of crops.
- .12 Rents.
- .13 Taxes.
- .14 Finance and accounts.

.2 Experimentation—

- .21 Private experiments.
- .22 Official experiment stations—
  - .221 History and organization.
  - .222 Legislation.
  - .223 Finances.
  - .224 Equipment.

630. AGRICULTURE—Continued.

.3 Rural life.

(*See also* 640, Domestic economy.)

631. SOILS:

.1 Origin and classification.

(*See also* 550, Geology.)

.2 Physics—

.21 Temperature.
.22 Atmosphere.
.23 Water—
.231 Hygroscopic.
.232 Capillary.
.233 Ground water.
.234 Drainage.
.235 Irrigation.
.236 Mulching.
.24 Tillage.
.25 Reclamation.

.3 Chemistry—

.31 Organic constituents.
.32 Inorganic constituents.
.33 Analyses.

.4 Fertilizers—

.41 Mineral amendments—
.411 Lime.
.412 Marl (for potash marls, *see* 631 .42).
.42 Potash fertilizers—
.421 Wood ashes.
.422 Chlorids.
.423 Sulphates.
.43 Phosphoric acid fertilizers-
.431 Natural rock.
.432 Ground bone.
.433 Soluble or partly soluble.
.434 Phosphatic slags.
.44 Nitrogen fertilizers—
.441 Ammonia salts.
.442 Nitrates.
.443 Organic nitrogen.
.444 Fish.
.445 Blood.
.446 Tankage.
.447 Vegetable nitrogen fertilizers.
.45 Compound fertilizers.
.46 Farmyard manure—
.461 Production.
.462 Preservation and storage.
.463 Composition.
.464 Application.
.465 Valuation.
.47 Vegetable amendments—
.471 Muck.
.472 Leaves.
.473 Seaweed.
.474 Green manures.
.48 Fertilizer experimentation.
.49 Fertilizer inspection, legislation, statistics.

.5 Soil bacteriology.

632. PLANTS:

.01 History and uses.
.02 Botany.

(*See also* 580, Botany).

.03 Composition and valuation.
.04 Culture—
.041 Choice and preparation of soil.
.042 Seeds and germination.
.043 Planting and transplanting.
.044 Crossing, budding, grafting, layering.

632. PLANTS—Continued.

.04 Culture—Continued.
.045 Cultivation.
.046 Manuring.
.047 Training and pruning.
.048 Forcing.
.049 Protection from wind, frost, etc.
.05 Hindrances to growth—
.051 Vegetable parasites.
.052 Weeds.
.053 Insects.
.054 Birds.
.055 Animals.
.06 Harvesting, curing, storage.
.07 Packing, shipment, marketing.
.08 Manufactured products.
.09 Statistics.

(632 .1 to 632 .4 may be divided like 632. For example, 632 .1206 is harvesting, curing, and storage of forage crops.)

.1 Field crops—

.11 Cereals—
.111 Barley.
.112 Buckwheat.
.113 Maize.
.114 Millet.
.115 Oats.
.116 Rice.
.117 Rye.
.118 Wheat.
.119 Other.
.12 Forage crops—
.121 Grasses—
.1211 *Blue grass.*
.1212 *Cereal grasses.*
.1213 *Fescues.*
.1214 *Orchard grass.*
.1215 *Redtop.*
.1216 *Timothy.*
.1219 *Other.*
.122 Legumes—
.1221 *Alfalfa.*
.1222 *Clovers.*
.1223 *Cowpeas.*
.1224 *Soy beans.*
.1225 *Vetches.*
.1229 *Other.*
.123 Other.
.13 Root crops—
.131 Beets.
.132 Carrots.
.133 Mangel-wurzel.
.134 Parsnips.
.135 Potatoes.
.136 Ruta-bagas.
.137 Turnips.
.139 Other.
.14 Sugar-yielding plants—
.141 Beets.
.142 Cane.
.143 Maple.
.144 Palm.
.145 Sorghum.
.149 Other.
.15 Alkaloidal plants—
.151 Cinchona.
.152 Cocoa.
.153 Coffee.
.154 Kola.
.155 Poppy.
.156 Tea.
.157 Tobacco.
.159 Other.
.16 Starch-yielding plants.
.17 Textiles—
.171 Cotton.
.172 Flax.
.173 Hemp.

632. PLANTS—Continued.

.1 Field crops—Continued.

.17 Textiles—Continued.

.174 Jute.
.175 Ramie.
.179 Other.

.18 Tannin-yielding plants—

.181 Canaigre.
.183 Sumach.
.189 Other.

.19 Other.

.2 Garden crops—

.21 Vegetables—

.211 Edible roots—
.2111 *Beets.*
.2112 *Carrots.*
.2113 *Horseradish.*
.2114 *Parsnips.*
.2115 *Radish.*
.2116 *Salsify.*
.2117 *Sweet potato.*
.2118 *Turnip.*
.2119 *Other.*

.212 Edible stems—
.2121 *Celery and celeriac.*
.2122 *Kohl-rabi.*
.2123 *Leek and garlic.*
.2124 *Onion.*
.2125 *Potato.*
.2126 *Rhubarb.*
.2129 *Other.*

.213 Edible leaves—
.2131 *Aromatic herbs.*
.2132 *Brussels sprouts.*
.2133 *Cabbage.*
.2134 *Kale.*
.2135 *Lettuce.*
.2136 *Spinach.*
.2139 *Other.*

.214 Edible flowers—
.2141 *Artichoke.*
.2142 *Cauliflower.*
.2149 *Other.*

.215 Edible fruits—
.2151 *Cucumber.*
.2152 *Eggplant.*
.2153 *Muskmelon.*
.2154 *Pepper.*
.2155 *Pumpkin.*
.2156 *Squash.*
.2157 *Tomato.*
.2158 *Watermelon.*
.2159 *Other.*

.216 Edible seeds—
.2161 *Beans.*
.2162 *Corn.*
.2163 *Peas.*
.2169 *Other.*

.217 Musbrooms.

.22 Pomaceous fruit—

.221 Apple.
.222 Pear.
.223 Quince.
.229 Other.

.23 Drupaceous fruit—

.231 Apricot.
.232 Cherry.
.233 Date.
.234 Nectarine.
.235 Olive.
.236 Peach.
.237 Persimmon.
.238 Plum.
.239 Other.

.24 Citrus and other fruits—

.241 Banana.
.242 Citron.
.243 Fig.
.244 Lemon.
.245 Lime.

632. PLANTS—Continued.

.2 Garden crops—Continued.

.24—Citrus and other fruits—Cont'd.

.246 Orange.
.247 Pineapple.
.249 Other.

.25 Small fruits and berries—

.251 Blackberry.
.252 Cranberry.
.253 Currant.
.254 Gooseberry.
.255 Mulberry.
.256 Raspberry.
.257 Strawberry.
.259 Other.

.26 Grapes (Viticulture).

.27 Nuts—

.271 Chestnut.
.272 Chinquapin.
.273 Hazelnut.
.274 Hickory nut.
.275 Pecan.
.276 Walnut—
.2761 Butternut.
.2762 Black walnut.
.2763 Persian walnut.
.279 Other.

.3 Flowers and ornamental plants.

(*See also* Landscape Gardening, 710.)

.4 Forest trees.

633. ANIMALS:

(*See also* 619, Diseases of animals; 591 .7, Anatomy; 591 .1, Physiology.)

.02 Breeds.

.03 Food and feeding.

(*See also* 694 .95, Hygiene of feeding.)

.04 Care and housing.

(*See also* 694 .94, Hygiene.)

.05 Breeding.

(*See also* 591 .3, Embryology; 591 .56, Breeding habits.)

.06 Cost, yield, profit.

.07 Exhibiting, judging.

.09 History, statistics, legislation.

(Divide 633 .1 to 633 .93 like 633.)

.1 Cattle—

.11 Beef cattle.

.12 Dairy cattle.

(*See also* 634, Dairying.)

.13 Draft cattle.

.2 Horses—

.21 Racing horses.

(*See also* 798, Horsemanship and racing.)

.211 Trotting horses.
.212 Pacing horses.
.213 Running horses.

.22 Draft horses.

.23 Coach horses.

.24 Ponies.

.3 Asses and mules.

.4 Sheep and goats.

.5 Swine.

.6 Camels, elephants, rabbits.

.7 Poultry—

.71 Hens.

.72 Ducks.

.73 Geese.

633. ANIMALS—Continued.
.7 Poultry—Continued.
.74 Turkeys.
.75 Pigeons.
.76 Other.
.8 Fish, oysters, terrapin, frogs.
.9 Beneficial insects—
.91 Bees.
.92 Silkworm.
.93 Cochineal.

634. DAIRYING:
(*Divide like* 630 .01–09.) (*See also* 664 .3, Artificial dairy products; 614 .32, Adulterations; 543 .2, Analysis.)
.1 Milk—
.11 Composition.
.12 Properties.
.13 Drawing and handling.
.14 Marketing.

634. DAIRYING—Continued.
.2 Cream—
.21 Composition.
.22 Properties.
.23 Raising and handling.
.24 Marketing.
.3 Skimmed milk.
.4 Butter—
.41 Composition.
.42 Properties.
.43 Manufacturing and handling.
.44 Marketing.
.5 Buttermilk.
.6 Cheese—
.61 Composition.
.62 Properties.
.63 Manufacture and handling.
.64 Marketing.
.7 Whey.

NOTE.—The numbers used are those which would fit into the decimal system of Mr. Melville Dewey. All matter covered elsewhere in that system is omitted, and all matter not agriculture, with the exception of dairying, a purely manufacturing process, which is so general among farmers as to be necessarily included. Farm machinery and implements should be placed with the operation in which they are used. Farm buildings go under Architecture; roads under Engineering; drainage and irrigation under Soils. Descriptions of insects go under Entomology, and those of plant diseases under Pathological botany.

It is the intention to suggest this classification for use in classifying index entries as well.

W. P. Cutter stated that he wished to take on his own shoulders the responsibility for all the omissions or mistakes which might be discovered in the classification. The work was done after consultation with other members of the committee, but was solely his own. He called attention to the fact that the classification does not cover all the subjects taught in the agricultural colleges, but simply the subject of agriculture. It does not embrace the subjects of engineering and architecture, nor does it cover entomology and botany, except as they affect the plant. The subject of dairying is included, because that is so closely linked with the work of the farmer as to be really a part of agriculture, although it is distinctly a manufacturing process.

On motion of Mr. Armsby, the report was accepted as a report of progress and the committee continued.

Mr. CUTTER. I should like to say a few words about the assistance that the library of the Department of Agriculture can be to the libraries of the various agricultural colleges. I wish to call attention to the fact that the library of the Department is for the use not only of the employees of the Department, but of specialists in the agricultural colleges and experiment stations. We have made a practice of sending out books of reference, even those which are rare and valuable, to men all over the country who are interested in some specialty. We are glad to do this at any time, and the service involves no expense to the worker, the books being sent under registered frank both ways.

We shall be glad to be of assistance at any time to the president or the librarian of any college in giving advice as to caring for and classifying the library. We hope not only to be able to do this, but, if the case is urgent, to be able to detail some one from our Department to go to the college or experiment station and assist the officers there by showing how to start the library in good shape. I wish to call the special attention of those who have small libraries to the necessity of arranging them while they are small. I have had some experience in rearranging libraries of about 45,000

volumes, and I pity any person who may have a similar experience to go through. If you have at this time a library of 2,000 or 3,000 volumes, it may not seem to need cataloguing or classifying; but I wish to urge that this is a good time to begin such work—to begin it while the number of books is small.

In most of the colleges the students, especially in other subjects than agriculture, rely largely on the library, and yet the condition of the libraries at some of the agricultural colleges is really deplorable. If we can be of assistance to any officials of the colleges in straightening out their libraries or in loaning books or in filling sets of Department publications, we shall be very glad to render such service.

A. Ellis, of Colorado, made some remarks on the subject of statistical and other information requested by the Department of Agriculture and other Departments in Washington from the stations and colleges. He expressed the opinion that much unnecessary labor was required from the institutions furnishing the information sought. Further remarks on the subject were made by Messrs. True, Atherton, Cutter, Armsby, Mell, and Butterfield. Mr. True said that much of the statistical information called for by the Office of Experiment Stations was requested by the Association. Mr. Atherton suggested that, to avoid duplication, the Bureau of Education and the Office of Experiment Stations might get together and agree on schedules to be sent out to the different institutions. He thought both the Bureau of Education and the Office of Experiment Stations were doing valuable work in collecting statistics.

H. P. Armsby stated that he had not found the requests received from the Office of Experiment Stations a serious burden, or that they called for a very large amount of work, after the system of operation was understood. What he had found most burdensome was the requests coming, for instance, from the chairmen of sections, or occasionally from committees of this Association, but more particularly from chairmen of sections, every year for the collection of statistical material. He stated that these requests were sometimes almost a nuisance, and in undertaking this kind of work the chairmen of sections were doing something which in his opinion was not contemplated when they were appointed. They were not appointed to collect statistics from the colleges and experiment stations. The provisions of the constitution requiring them to make reports contemplated, in his judgment, something entirely different.

I. H. Butterfield. Under the resolution submitted this morning relating to military instruction in colleges, I apprehend the executive committee, to whom the matter was referred, does not intend to consider the suggestion made by President Bryan regarding the methods or amount of such instruction, or the relations of colleges to the Departments of the Government in reference to such instruction. In order to carry out that suggestion, I have written a resolution which I would like to offer now, if it be the pleasure of the convention to receive it.

The resolution was read, as follows:

Resolved, That a committee of five be appointed to consider and report at the next meeting, in 1899, the obligations of the land-grant colleges relating to military instruction at such colleges under the land-grant act, and also under the act detailing United States military officers as instructors at such colleges, and also as modified by rules and regulations of the War Department.

The Chairman. The resolution will be referred without debate to the executive committee. (For action see p. 74.)

Adjourned until evening.

Evening Session, Wednesday, November 16, 1898.

The convention reassembled at 7.30 o'clock, President White in the chair, and proceeded to a further consideration of the proposed amendments to the constitution, the secretary reading the report of the committee on revising the constitution.

G. W. Atherton. Mr. President, I have not had sufficient opportunity to confer with the different members of the Association to know what the real sentiment of

this body is in respect to these proposed amendments. I do not know that it is worth while to go into any protracted discussion—certainly not if the mind of the Association is fixed. I wish to say that during the last year, although this subject was under consideration in the last convention, I have not been able to give it any reflection whatever, so that what I shall say is not inspired by any particular reference to the views that may be held by others respecting the proposed changes. But its seems to me that it might be desirable to call the attention of the Association to two or three important points.

In the first place, as I have been able to-day for the first time to look over the proposed amendments and compare them with the present provisions of the constitution, I am bound to say they meet my unqualified approval. If adopted, they will bring the Association back to its original purpose and its proper work. I have felt for some years past that I saw a tendency to drift away from that, so far at least as to obscure in the minds of members themselves the main purposes of the Association. When the Association was organized there were no such things as experiment stations in existence in connection with the several colleges—at least none supported by the United States; none were in existence except those which had been organized in the several States by separate State legislative action. There had been held here in Washington, from time to time, under the auspices of the Commissioner of Agriculture (as he was then called), a kind of free convention of all such persons interested in agriculture as chose to attend. Such a convention had first proposed to it the consideration and support of what was then known as the Cullen bill, the predecessor of the Hatch bill; that is to say, a bill introduced by Mr. Holmes, of Iowa, was modified, upon consultation with that gentleman; was then referred to the Committee on Agriculture, and by it referred to a subcommittee of which Mr. Cullen, then a Representative from Illinois, was chairman, and he reported back the bill without amendment. But no action was then taken by Congress, the session being too far advanced.

When the next session opened Mr. Hatch had been induced to identify himself with the advocacy of the measure, and from that time it became identified with his name. While the Cullen bill was pending such a convention as I have referred to met—a convention of the same kind that had been meeting from time to time in a very vague and irregular way, with no continuous organization. In that convention a committee on legislation was appointed to promote the passage of the Cullen bill, which was then brought to the attention of that convention (the body meeting at the Department of Agriculture); and at that time the idea began to grow, especially among the colleges represented in the convention, that as these new experiment stations which were proposed were, according to the proposed measure, to be integral parts of the college organization, the colleges ought to get together and form some continuous organization. Without going into details (all of which are very familiar to some gentlemen here, though perhaps not to the younger members) steps were taken and were carried into effect by which a convention, called by the Commissioner of Agriculture, was switched off on independent lines; and from that time the Association has had an independent, organic, continuous existence.

I have given this outline of the history of the formation of the Association in order to indicate the purpose for which it was established. We saw that our land-grant colleges were to sustain a wholly new relation to the Government of the United States on the one hand and the governments of the States on the other hand, because by the original law of 1862, as we all understand, these colleges were required to carry on their work of instruction in such manner as the legislatures of the States should respectively prescribe, the broad outline being laid in the act of Congress, but the manner of administering and filling up that outline being left specifically to the State legislatures.

Now, if Congress was to come in and give additional support to an additional branch or department of these colleges, naturally the States must take charge (and

this was provided by the law of 1887) of the administration of this branch; and, as this department of work was naturally one which would come into very close contact with a very large section of the people in each State, the relation of the institutions to the legislatures of the States would become much closer than ever before, except in those States that had already, by legislative action, provided for some continuous supervision of the institutions.

It was these considerations that led the colleges to feel that they ought to form an association to discuss the new questions which would arise; and I think the history of the Association and of the work which it has accomplished has more than justified the wisdom of that movement.

Now, it seems to me that for the last eight, nine, or ten years we have been drifting along, taking up such questions as came, without giving any decided direction to the policy of the Association and without undertaking to mark out its field of work. The consequence has been, very naturally, that we have come to consider in our several sections, not simply those questions which the Association was organized to consider—questions relating to the organization and administration of the colleges and stations, questions relating to our connection with the United States Government on the one hand (this being one of the most difficult and delicate branches of work that our executive committee has from time to time had to deal with), not merely questions relating to our connection with the State governments—but also the specific subordinate questions which each station and college can largely settle for itself, which do not require the organization and maintenance of an association of this kind, questions the presence of which has always acted and, according to my thought, must more and more act as a disturbing element in the proceedings of this Association.

Do not misunderstand me when I say "disturbing element." I mean simply to refer to such matters as have come within our experience; for example, yesterday and to-day. It is impossible for anyone, however much he may wish to do so, to keep the run of all our proceedings and their relations to the work of the colleges and stations and the work of the Association. It is impossible, also, for the Association as such, in general session, to consider fully and adequately all the questions that come up for consideration—these larger and more important questions, because they are permanent and because they are vital to the whole system. For instance, I have to-day and last night undertaken, at three different times, to have meetings of committees for conference on important general questions, but have found it possible to get only one meeting as the result of these three efforts, and that meeting not quite fully attended, because one of the leading members of the committee was engaged in conference with another committee in reference to other work. And we have finally adjourned our meeting—I hope gentlemen will not be shocked by our industry—until half past 8 o'clock to-morrow morning, thus showing at least that we are diligently making an effort to do our work.

Now, we need—and this is my principal point here—we need the undivided attention of the college men and the station men when we come together to consider these other questions—questions which are growing larger all the time. If I understand the drift of public sentiment on educational matters at the present time, it has two very marked tendencies. One is toward the unifying of the whole system of public education, from highest to lowest. If there is any one thought that has taken possession of the mind of educators and public men more than any other, especially west of the Alleghenies, it is the great question of bringing all grades of public education into such correlation that each one shall be organically connected and identified with the others.

The second great movement is one which is taking place more slowly in the country east of the Alleghenies than in the West. It is a very vital question. In the West the controlling sentiment is fully settled in favor of public support to higher education. There is, however, a very large section of people all through the older States who are utterly opposed to giving any aid to higher education, and this great movement which was begun by the Morrill act in 1862, I very much incline to think,

if it had been understood at the time by the States which accepted it, would have been rejected in many of those States. It is one of those instances where the general, the vague idea seemed to be accepted or favored by the majority of the people, but without their defining to themselves what it meant; so that in this case we may say, as has been said in many other cases, that Senator Morrill and those who worked with him "builded better than they knew." That bill laid the foundation for the establishment of a system of public support for higher education in all its grades, including college and university, based upon the system of common schools—primary, secondary, high schools—which existed in some of the States. But we find that in some of the States we have now to meet the same argument, to go through the same contests of debate with reference to public support for higher education that our ancestors, our predecessors, had to go through with reference to public support for elementary education. This contest for higher education is now going on in very many communities over all the country.

Now, it seems to me that this condition of things—the condition of which I speak—in the eastern part of the country, and the condition involved in what I have said of the western part of the country, where the sentiment in favor of higher education seems, as I have said, to be well settled—all this involves a consideration of the largest questions relating to public education that can possibly come before the minds of thoughtful men anywhere.

We all accept the elementary principle stated by Washington, to the effect that in proportion as the institutions of a country reflect public opinion it is necessary, indispensable, that that opinion be intelligent and educated. When this idea was first put into effective form it took the shape simply of common education—"the three R's"—for the mass of the people. At that time—I beg gentlemen to tell me whether this is not the exact situation—at that time the problems of government and of public life were so simple that men who had the ordinary elementary education were fitted to deal with them in almost all their relations. Now, if a democracy in self-protection must educate its citizenship, must it not do so in proportion to the complexity and difficulty of the problems with which the citizens have to deal? Thus the more difficult the problems of an advancing and complex civilization become, the more thorough and broad and far-reaching must be the education open to the masses of all the people. It seems to me this argument is absolutely conclusive: If a democracy is to be educated, it must be educated on a plane adequate to the requirements which meet that democracy in its public relations.

Now, in our townships—in our various governmental subdivisions, whatever name they may be called—how do we act? We say, "There is a young man who is fit to be a school director or a road overseer, or to fill some other minor office." Later his fellow-citizens say, "He is a fit man for some county office, or for the State legislature." Having discharged well the duties of a lower official grade, he is promoted to one of the group of offices next above. Finally he is recognized as belonging to the class of men from whom may fitly be chosen our Senators, or foreign representatives, or President. By this process of training and education we take up from the mass of the people, step by step, the men who are to be the leaders of the people. If a democracy is to select its leaders from men who are in sympathy with its own ideas and impulses, it must open to the whole people avenues to an education as high, as complete, as thorough as that which is open by the necessities of the case to the sons of the wealthy. Otherwise, the machinery of official control, in its higher ranges of activity, will fall into the hands of the wealthy oligarchy which is so rapidly growing up. And that is just as inevitable, to my judgment, as anything can possibly be.

Now, the questions which agricultural colleges have been formed to meet and deal with in our States and in our associated capacity are large enough to call forth all our best energy, to absorb all the time we can give to them when we get together. And, in my judgment, we ought to eliminate everything that can possibly interfere with the discharge of these high duties.

For these reasons, very imperfectly stated and without opportunity for careful reflection, I am very heartily in favor of the adoption of the majority report. I hope it will receive the approval of this convention.

The subject was further discussed by Messrs. E. A. Bryan, C. E. Thorne, C. D. Woods, W. O. Atwater, S. M. Emery, H. J. Wheeler, and J. K. Patterson.

The CHAIRMAN. If no further discussion is desired, the vote will be taken.

The provision of the constitution with regard to voting on proposed constitutional amendments was read and a vote was taken upon the adoption of the majority report.

The report was rejected, there being 8 votes in the affirmative and 44 in the negative.

The CHAIRMAN. The secretary will now read the report of the minority of the committee on this subject of amendment to the constitution.

J. K. Patterson moved to lay the minority report on the table. Carried.

The CHAIRMAN. The next business in order is the report of the committee on graduate work at Washington. In the absence of the chairman of the committee the report will be presented by Chancellor MacLean, of Nebraska.

After some preliminary remarks on the importance of the subject Mr. MacLean read the report of the committee, as follows:

THE REPORT OF THE COMMITTEE ON GRADUATE STUDY AT WASHINGTON.

Your committee respectfully reports progress as follows:

The following resolution was introduced at the session of the Association in Minneapolis, July, 1897:

"*Resolved*, That a committee of five be appointed by the president to investigate, consider, and, if practicable, devise a plan whereby graduate students of the land-grant and other colleges may have access to and the use of the Congressional Library and the collections in the Smithsonian Institution, the National Museum, and the scientific bureaus of the various Departments at Washington of the United States Government for the purposes of study and research, said plan to include suggestions as to the manner in which such work may be organized, coordinated, and directed to the best advantage; the composition and organization of such a staff as may be necessary to properly coordinate and direct such work, and also an outline of such legislation as may be necessary to effect the general purposes of this resolution. To this committee a sixth member was added by vote of the convention, said committee to report at the next meeting of the Association."

In accordance with the preceding resolution of the Association the committee met on the afternoon of July 15, 1897, in President Northrop's office in the University of Minnesota.

Present: President Cyrus Northrop, of Minnesota; Capt. Alexis Cope, of Ohio; President J. H. Washburn, of Rhode Island; President Alston Ellis, of Colorado, and Chancellor George E. MacLean, of Nebraska. Absent: President M. H. Buckham, of Vermont.

President Northrop was elected chairman, he stipulating, however, that he should not have the burden of the work to carry. G. E. MacLean was made secretary of the committee.

It was resolved that the committee should meet at some convenient date in Washington for the purpose of consulting heads of Departments and gaining information.

The committee adjourned to meet upon the call of the chairman or secretary.

On April 5, 1898, with the approval of the chairman of the committee, the secretary of the committee called for a meeting of the committee in Washington, D. C., on April 25.

On June 25, 1898, the secretary of the committee received the following report from the members of the committee that met in Washington, D. C., on April 25, 1898:

Captain Cope and President Washburn conferred with Director True of the Office of Experiment Stations, who assisted them materially in meeting the heads of Departments who would not be especially affected by the war. The committee were accompanied by Dr. A. C. True and President Goodell in the calls made upon Departments.

The first visit was to the executive curator of the National Museum, Dr. F. W. True, who impressed upon the committee the fact that there are ample facilities in the line of material for instruction, but absolutely no room for laboratories at the Museum.

Dr. True sent for Mr. F. A. Lucas, who has charge of a portion of the Museum. Mr. Lucas seemed to take the same ground as Dr. True, thinking it would be delightful to have students connected with the institution if only there were funds provided

and proper persons to direct them. He felt that these funds should be derived from other sources than those of the institution. He told of very satisfactory work which has already been accomplished in past years in this line of study, and spoke of the large number of scientists who have risen to eminence who studied there as boys, working in just such a way as proposed by our committee. Those days, however, were in the earlier history of the National Museum when there was ample room. The space then used for laboratories, and even living rooms by the students, is now crowded with so much material belonging to the institution that it can not be adequately cared for. Rearrangement of duties would be necessary before much teaching could be entered upon by the scientific workers, although it is the desire of all connected with the institution to help those who are searching for knowledge. At the present time they have nearly 300 students in the different departments, some working here, some there.

The Secretary of the Smithsonian Institution was visited, but was not found in, and the assistant secretary in charge, Dr. Richard Rathbun, was interviewed. He regretted that we were unable to see Secretary Langley. He added that the workers now have a sufficient diversity of duties, but he conceded there were wonderful opportunities for gradnate students in the wealth of material in the departments.

The committee was then introduced by Dr. True to the Chief of the Geological Survey, Director Charles D. Walcott. It was his opinion that a plan to carry out the ideas embodied in the resolution of the Association creating this committee would be very desirable, and that such work should be placed under the direction of the Smithsonian Institution. He believed that this would be the unanimous opinion of those interested in such a movement. It was again impressed upon the committee that the institution has not adequate space for all the material owned by it. He had already held conversations with some members of Congress relating to the building of a new museum which should be adequate for Governmental purposes, and it seemed to him very feasible that this museum should have added to it sufficient laboratories for the use of graduate students. He felt that it would be an inspiration to many of the scientific workers who love teaching to have an opportunity to engage in it, and that it would be a very simple matter to correlate their work so that this might be accomplished as soon as room was afforded where such special work might be carried on. He approved heartily of any plan which would place the care and direction of students under the Smithsonian Institution, and advised us to secure, if possible, the cooperation of the Secretary and Board of Regents of that Institution.

The following day the committee visited Dr. C. Hart Merriam, of the Department of Agriculture, who seemed quite enthusiastic at the thought of using the wealth of educational treasures for the purposes of instruction. It was a subject to which he had given a great deal of attention, and he presented to the committee a synopsis of a number of lectures which could be given upon zoological subjects at a very slight expense. He had even estimated the cost of several lectures which might be given by many of the departments, and prepared a scheme for some biological work.

In this scheme he said: "So far as America is concerned, it is safe to say that at Washington the facilities for higher education in the sciences are unequaled. No other city in the Union has so large a corps of eminent men engaged in original research in the fields of geology, geography, anthropology, zoology, botany, chemistry, and astronomy. (The committee venture to add among other subjects meteorology, political and social science, and kindred subjects.)

"Most of these men are employed and paid by the Government, so that their services in lecturing and superintending laboratory work could be had at a trifling expense. All that is needed is organization, a home, and a small fund. Incredible as it seems, an excellent course in science, comprising 350 lectures and 140 evenings of laboratory work by 40 different specialists, can be given in this city for the insignificant sum of $5,000, the salary of a single professor in our leading universities.

"The biological part of the course would be particularly strong, the plans having progressed so far that a course of 150 lectures and 140 evenings of laboratory work has been arranged for in zoology and botany. In these branches special emphasis could be given to the systematic and economic sides neglected in most of our universities. The instruction would be given by at least 20 specialists, each proficient in some line of biological research. Courses of equal merit can be arranged in the courses above mentioned. As a recent writer has said, 'The genius and training are already here, most of the facilities are already provided, and little remains to be done, save the coordination of existing instrumentalities.' It is of the utmost importance that the early steps be guided by wisdom and experience."

At the Fish Commission the committee found that both the head of the department, Mr. George M. Bowers, and Dr. Hugh M. Smith were deeply interested in any scheme which would make their work and the material under their charge of more benefit to the students of the country. Since the new chief was placed at the head of the department the station at Woods Hole has been kept open the entire year,

instead of only through the summer months, for the purpose of giving further attention to students interested in their line of work. It was the expressed desire of the chief to make his department as useful as possible. He suggested that at the present time one table in the laboratories might be given to students, so that at least a half dozen could be accommodated.

At the Congressional Library Mr. John R. Young, the new Librarian, was very attentive to our committee, and assured them that their request might be granted. He said that anyone in search of information was welcome, and every facility was offered in the reading room and elsewhere, and that if students of good character came to them properly recommended they were allowed to go among the stacks to "browse," to become acquainted, and to see and handle the books for themselves. Special tables are granted those students to whom it may seem desirable to grant such privileges. Apparently all the privileges which could be required by our students were already granted to persons of good character, whether graduates of any institution or not. Nothing remained for us to wish, except, perhaps, that our graduates might be placed under the direction of some prominent, competent man.

The committee then called upon Mr. Henry S. Pritchett, Chief of the Coast and Geodetic Survey, who was very much pleased with any scheme of assisting students, and felt that it would not be detrimental to the work to instruct a few students in the science of map making and other branches taken up by this department, but would impart increased vigor. He would be glad to give these students ample accommodations.

The committee, accompanied by President Goodell and Dr. True, called on the Secretary of Agriculture, Hon. James Wilson. The Secretary received the committee very courteously, and at once manifested great interest in the project. He generously promised us all the assistance in his power. Since the visit of the committee, in public addresses he has openly advocated making provision for graduate work in the several scientific bureaus of the great Department of Agriculture, and has originated and devised a scheme for maintaining a number of graduate students as aids in his Department. This would put at the disposal of our colleges what would practically be a number of fellowships.

Some idea of the work which may be opened up by the proposed action of the Department of Agriculture may be gained from a pamphlet published by the Department January 11, 1898, under the title—

THE DEPARTMENT AS AN AGENCY FOR RESEARCH AND EDUCATION IN AGRICULTURAL SCIENCE.

Weather Bureau.—Researches in climatology and meteorology.

Bureau of Animal Industry.—Researches on animal diseases, including chemical, bacteriological, and zoological investigations.

Division of Statistics.—Collection and study of agricultural statistics.

Division of Entomology.—Researches on life history and geographic distribution of insects and on means of repression of injurious insects.

Division of Chemistry.—Researches on soils, fertilizers, foods, sugar-producing plants, methods of analysis, etc.

Division of Botany.—Researches on the natural history, geographic distribution and utilization of plants, and special studies on seeds and on poisonous and medicinal properties of plants.

Division of Forestry.—Researches on the natural history, biology, and utilization of forests and forest trees and on timber physics.

Division of Biological Survey.—Researches on the geographic distribution of plants and animals and on food habits of birds and mammals.

Division of Pomology.—Studies on varieties of fruits.

Division of Vegetable Physiology and Pathology.—Researches on the physiology and diseases of plants.

Division of Soils.—Researches in agricultural physics, especially on the physical properties, moisture, temperature, etc., of soils.

Division of Agrostology.—Researches on the natural history, geographical distribution, and utilization of grasses and forage plants.

Office of Fiber Investigations.—Studies on the nature and utilization of fiber plants.

Office of Road Inquiry.—Experiments in road engineering.

Office of Experiment Stations.—Collection and dissemination of information regarding agricultural education and research in the United States and other countries. Supervision of cooperative investigations on the food and nutrition of man.

The Library.—Contains 57,923 volumes, largely on agriculture and agricultural science.

Publications.—During the year ended June 30, 1897, the Department issued 424 bulletins and reports, the total number of copies being 6,541,210, exclusive of the Yearbook, which has an edition of 500,000 copies.

Prof. Willis L. Moore, Chief of the United States Weather Bureau, was next

visited. It was found that Professor Moore had been at work upon this line of thought for a long time, and he explained how much he was doing to educate people in the science pertaining to his department, sending to our colleges maps, reports, and charts of the Weather Bureau, with deductions of practical value derived from the observations made. He felt that he would like to do everything in his power to have his department cooperate in a scheme such as proposed by your committee.

In a discussion with Professor Abbe, editor of the Monthly Weather Review, attention was called to an article on page 63, volume 26, of this magazine, showing that he had in mind the work which our institutions are doing.

At the invitation of Professor Abbe, President Washburn accompanied him to visit Mr. A. Graham Bell. Upon explaining to Mr. Bell the resolution authorizing this committee he seemed highly interested in the idea. He was, of course, unable to speak for the Regents of the Smithsonian Institution, but could only state, in accordance with the impression then received, and without looking further into the matter, that if Secretary Langley were willing to take up such work he believed there would be no objection, but it would, on the contrary, be considered very desirable. He was fully aware of the fact that the wonderful facilities in Washington should be made more available to students.

President B. L. Whitman, of Columbian University, chairman of the committee for higher education of the National Educational Association, was seen. In discussing the resolution President Whitman seemed to feel that the land-grant colleges were asking for a favor very similar to that granted by Congress April 12, 1892, to certain institutions in the District of Columbia, and that it was a very legitimate desire on the part of the committee to wish to utilize these privileges. Dr. Whitman seemed to favor the measure.

The action of Congress referred to is the joint resolution passed by Congress April 12, 1892:

"*Resolved by the Senate and House of Representatives of the United States of America in Congress assembled,* That the facilities for research and illustration, in the following and any other governmental collections, now existing or hereafter to be established, in the city of Washington, for the promotion of knowledge, shall be accessible under such rules and restrictions as the officers in charge of each collection may prescribe, subject to such authority as is now or may hereafter be permitted by law, to the scientific investigators, and to the students of any institution of higher education now incorporated or hereafter to be incorporated under the laws of Congress or of the District of Columbia, to wit:

"(1) Of the Library of Congress; (2) of the National Museum; (3) of the Patent Office; (4) of the Bureau of Education; (5) of the Bureau of Ethnology; (6) of the Army Medical Museum; (7) of the Department of Agriculture; (8) of the Fish Commission; (9) of the Botanic Gardens; (10) of the Coast and Geodetic Survey; (11) of the Geological Survey, and (12) of the Naval Observatory."

Presidents White and Goodell attended the meeting in July of the National Educational Association. This committee interviewed Commissioner Harris, who declared himself as being strongly in favor of the movement. Dr. A. Graham Bell was also interviewed by them.

The committee met at the Ebbitt House on Monday, November 14, 1898. By invitation Director True and Presidents White, Goodell, and Stubbs sat with the committee. By invitation Mrs. Calvin S. Brice, of the advisory council of the George Washington Memorial Association, honored the committee with her presence. She presented the interests of the George Washington Memorial Association in providing an administrative building for a national university in Washington.

The committee desire to accord their hearty thanks for her able presentation of the subject and the valuable conference with her.

After long deliberation and full discussion, your committee are unanimously of the opinion that the time is ripe for expeditious action.

The inquiries and investigations so far made lead the committee to the conclusion that it is entirely practicable to provide for the use of the Library of Congress and the collections of the Smithsonian Institution, the National Museum, and of the various scientific and other bureaus in the several departments of the General Government, by graduate students of the land-grant, and other colleges for study and research, and that it is also practicable to organize, coordinate, and direct such work so as to make it eminently effective.

The committee has been greatly desirous that some existing agency be found to undertake such work of organization, coordination, and direction, and have naturally turned to the Smithsonian Institution as the one best fitted for the purpose.

Each of its great secretaries, Henry, Baird, and Langley, in the language of President Gilman, "has been free and has felt free to open new roads and enter fresh fields when the public good required it."

The permanence of its organization, its objects and purposes as expressed in the will of its founder viz, "the increase and diffusion of knowledge among men," the fact that it has nobly performed and is still nobly performing many of the functions

incident to the proposed scheme of graduate study and research, by the encouragement of investigation and research, the study of local history and archæology, and the founding of libraries and museums; its broad catholicity and its freedom from partisan influences have led the committee to hope that it might feel free to take the work in hand.

It already has all the officers and agents needed for its successful general control, and to them could wisely be left the selection of such additional officers and agents as might be necessary to direct the details of successful administration. It could wisely control and direct the application of all funds appropriated or donated for its support.

The committee has thought that perhaps the secretary and regents might not look favorably upon the idea of constituting the Smithsonian the permanent agent for the control and direction of such graduate work, but that they might be willing to take the initiative in its organization and direction, and when a successful plan was fully developed might generously relinquish its control to a separate and independent management, such as experience might suggest to be more wise and effective, as it did under Henry in the case of the Weather Bureau, under Baird in the cases of the National Museum, the Fish Commission, and the Bureau of Ethnology, and as it has done under Langley in the cases of the Astro-Physical Observatory and the National Zoological Park.

The committee regrets to report that on account of the engagements and absence of Secretary Langley, it has been unable to communicate with him upon the subject or to learn his views in relation to the proposed measures.

Any positive recommendation as to the agency for the organization, coordination, and direction of the proposed graduate work, and any detailed plan of organization, are therefore held in abeyance.

The committee is unable, at the present time, to present a complete outline of the legislation necessary to effect the general purposes of the resolution. It submits tentatively, however, that Congress might be asked to provide for the establishment of an administrative office in Washington, preferably in the Smithsonian Institution, in which graduate students of the institutions we represent, and others as well, might be enrolled and directed to the appropriate departments.

To maintain this office, pay the expenses of administration, support graduate courses of research, freely open to the graduate students of the land grant and other colleges without distinction of race, sex, or color, on such terms as the administrative office should prescribe, and to aid such students in their researches Congress might be asked to make an appropriation of, say, $25,000, to be increased annually $1,000, to be expended under the discretion of the institution or department in which the office of administration may be located.

The committee desires to make record of its deep obligations to the Hon. James Wilson, Secretary of Agriculture, and to Dr. A. C. True, Director of the Experiment Stations, for their continuous, practical, and efficient interest and aid in the labors of the committee.

In conclusion, the committee desires to say that the project of a graduate school, as outlined in the Minneapolis resolution before quoted, has been received with so much favor wherever it has been presented and discussed that they are unanimously of the opinion that it should be prosecuted with renewed vigor until it has become an accomplished fact.

For the committee. G. E. MacLean.

H. C. White (the vice-president being in the chair). I fancy no more important paper has ever been presented to the consideration of this Association than the report just read. I do not know that anything I can say can add to the force of the committee's own words in this report. They have taken a great deal of trouble; they have gathered a great deal of very interesting and important information concerning the status in Washington of the material and the men and the departments that are available for graduate work of our colleges. It may be that the time is ripe when we can put into actual operation some practicable scheme by which the graduates of our agricultural colleges, as well as other colleges throughout the United States, may speedily come to take advantage of the opportunities thus presented. With a view to this end, Mr. Chairman, and in order that it may be as speedily attained as possible, I offer the following resolution:

Resolved, That the partial report of the committee on graduate study at Washington be approved and adopted; that said committee be continued, and that it be empowered in connection with the executive committee to propose and secure, if practicable, such legislation as will carry out the object and purposes of the resolution under which it was appointed.

Mrs. Calvin S. Brice, upon invitation of the chairman, spoke upon the establishment of a national university in Washington. She referred to the inauguration of the George Washington Memorial Association a year ago and its effort to raise $250,000 by voluntary contributions of the men, women, and children of the country for the purpose of erecting a building on the plat of ground which George Washington designated as a site for a national university. This is to be tendered to the Government when it shall establish such a university.

Ex-Governor J. W. Hoyt was invited by the Association to speak on this subject. He expressed his interest in the work of the Association. He had found that there were something like forty divisions of the Government which could furnish facilities for graduate students, and hoped that in the near future a national post graduate university might be founded at Washington.

C. W. Dabney also spoke on the subject and congratulated the Association on the fact that at last it was proposed to do something definite in the matter. He referred to the efforts of a few scientific men in Washington who had labored to further this object, and said that it was not so much a large sum of money that was needed to make a beginning as a little central organization to coordinate the various bureaus of scientific work already under the Government. It was better to begin in a small way than to longer delay beginning.

The resolution of Mr. White was then voted upon and adopted.

The convention then adjourned.

Morning Session, Thursday, November 17, 1898.

The session was called to order at 9 o'clock by President White.

The committee on nominations, which consisted of G. E. MacLean, of Nebraska; A. A. Brigham, of Rhode Island; W. M. Liggett, of Minnesota; J. M. Kimbrough, of Georgia; M. E. Jaffa, of California; M. A. Scovell, of Kentucky; E. W. Allen, of the U. S. Department of Agriculture, and C. D. Woods, of Maine, reported as follows:

For president.—H. P. Armsby, of Pennsylvania.

For vice-presidents.—(1) J. E. Stubbs, of Nevada; (2) C. S. Murkland, of New Hampshire; (3) J. L. Snyder, of Michigan; (4) P. H. Mell, of Alabama; (5) F. P. Anderson, of Kentucky.

For secretary and treasurer.—E. B. Voorhees, of New Jersey.

For executive committee.—H. H. Goodell, of Massachusetts; Alexis Cope, of Ohio; J. H. Washburn, of Rhode Island; and W. M. Liggett, of Minnesota.

For bibliographer.—A. C. True, of Washington, D. C.

On motion of Mr. Ellis the nominations were confirmed.

J. B. Smith, for the Section on Entomology, reported the nomination of C. W. Woodworth, of California, for chairman, and Lawrence Bruner, of Nebraska, for secretary.

Confirmed.

B. D. Halsted stated that the officers nominated for the Section on Horticulture and Botany were L. H. Pammel, of Iowa, chairman, and S. B. Green, of Minnesota, secretary.

Confirmed.

Mr. Halsted also submitted the nominations of the following-named gentlemen to constitute a committee on nomenclature of fruits: F. A. Waugh, of Vermont; John Craig, of Iowa; W. A. Taylor, of the U. S. Department of Agriculture; L. R. Taft, of Michigan, and G. H. Powell, of Delaware.

On motion, these nominations were referred to the executive committee.

A. Ellis presented the following nominations for the Section on College Work: Chairman, C. W. Dabney, of Tennessee, and secretary, C. E. Coates, jr., of Louisiana.

Confirmed.

O. L. Waller submitted the following nominations for the Section on Mechanic Arts: Chairman, C. S. Murkland, of New Hampshire; vice-chairman, G. A. Harter, of Delaware; and secretary, F. P. Anderson, of Kentucky.

Confirmed.

The officers selected for the Section on Agriculture and Chemistry were: Chairman, J. L. Hills, of Vermont; vice-chairman, C. E. Thorne, of Ohio; and secretary, E. Davenport, of Illinois.

The question of the next meeting place of the convention was then taken up and an invitation on behalf of the Pacific coast was extended by M. E. Jaffa, of California, who suggested San Francisco as the most desirable coast city. His invitation was seconded by J. E. Stubbs, of Nevada.

Invitations were also extended by E. A. Bryan, of Washington, and H. T. French, of Idaho, to meet at Seattle, and by W. H. Jordan in behalf of New York State, either Ithaca or Geneva being considered by him a desirable meeting place.

The matter was referred to the executive committee.

T. E. Miller, president of the Colored Normal, Industrial, Agricultural, and Mechanical College of South Carolina, read a paper on "The undeveloped agricultural resources of South Carolina." This was a discussion of the natural advantages—soil, climate, forest products, water powers, etc.—of South Carolina and of the variety and value of its agricultural products, with some statistics of the industrial development of the State.

M. A. Scovell read a paper on "Some notes in connection with the testing of cows as to milk and butter production." On motion of H. E. Alvord, the paper was referred to the Section on Agriculture and Chemistry for further consideration (see p. 123).

C. W. Dabney presented the following paper on "Land-grant and other colleges and the national defense:"

Land-Grant and other Colleges and the National Defense.[1]

Two purposes were in the mind of the father when he wrote the bill for the land-grant colleges. His first object was to provide for scientific and technical education. Down to 1862 the colleges, established as they were by the churches, had been devoted almost exclusively to the study of the classics, philosophy, and theology. A few private institutions, like the Troy Polytechnic, had shown the value of technical education, and a few agricultural schools, chiefly manual-labor schools, had shown that practical agriculture could be taught successfully. But all of our other colleges stuck to the old Latin, Greek, and philosophy.

Perhaps the chief purpose in Senator Morrill's mind when he wrote this act was the establishment of a college in each State for the education of the children of the industrial classes in the sciences and arts used in the industries of life. These institutions were to supplement the work of the classical colleges and educate, not only agriculturists and horticulturists, but engineers and chemists also, who might develop the resources of our country. But this was not the only purpose of these colleges. At the time this act was under consideration the country was in the midst of a terrible civil war. The supporters of the union had learned through bitter experience, as was done again in the recent war, that the great need of the Army was trained officers. The second purpose of these colleges, one that was almost as prominent in the mind of the founder as was the industrial education, was the education of young men in military matters, who might render their country efficient service in any future emergency. At the time the act was passed this second purpose was perhaps the more prominent one in the public mind, though perhaps the first was the chief one in the mind of Senator Morrill, and has become, through long years of peace, to be regarded their only object. The time has arrived, however, when we must bring these national colleges back to their original principles and make them do the full work for which they were established. It is almost as much the duty of their management to encourage military training as it is to promote instruction in agriculture. Many of us have lost sight of our duty in this respect, but the new responsibilities recently laid upon our nation make our duty in this regard a very solemn one. These land-grant colleges must do their part in training officers for the greater Army and Navy which is to protect our new dependencies, as well as in educating the experts in industry who are to develop them.

The land-grant colleges have by no means failed in the past of their duty in respect to military education. Had they been helped more and been encouraged more by Congress they would doubtless have done much more. Besides the provision for the detail of army officers to act as professors of military science and tactics, and the allowance of a small quota of antiquated arms, Congress has done nothing

[1] See also U. S. Dept. Agr., Office of Experiment Stations Circ. 40.

to encourage military instruction in the land-grant institutions. Until 1887 there was no inspection of their military departments by the War Department, and nothing was done to recognize their military graduates until a few years ago, when the empty honor of enrollment in the Army Register was conferred upon them. Few of the institutions have armories or drill halls, and none have any equipment for encampments whereby cadet officers might get practical experience in field work. The chief difficulty has been, however, that no career was open to the young man who devoted a large part of his time during his college course to acquiring a military education. His training was of no practical use to him after spending much labor to get it. In most of the States there was no recognition for our graduates from the State government, no appointment in our National Guard, and, until recent years, no recognition for them from the War Department. The enrollment of honor graduates in the Army Register was appreciated, but led to nothing further until President McKinley, during the recent war, appointed a few officers in the Regular Army from this list.

In this paper an attempt is made to show what the land-grant colleges actually contributed to the national defense in the Spanish-American war. We propose to show by actual facts and figures that they have rendered an invaluable service to the nation, and that they deserve substantial recognition and support from Congress.

That civil institutions could train military officers was first proved by the experience of the civil war. One of the oldest institutions in the Eastern States is said to have furnished for the civil war from its alumni 12 general officers, 25 colonels, 40 field officers, and 198 company officers. On the Southern side the Virginia Military Institute was deservedly called the West Point of the Confederacy It is said that with few exceptions everyone of its thousand or more living graduates held office at some time during the civil war, in grades from major-general down to lieutenant. The record of the South Carolina Military Academy was equally remarkable. The Spanish-American war did not afford anything like the same opportunity for the colleges to show what their men could do, but the statistics obtained from the land-grant colleges show very plainly that it is not in vain that we have put our reliance in them. From all the presidents the reports come that many whole organizations were refused by the governors, and that hundreds of young men who sought appointments as officers, and thousands of others who wished to enlist, found no opportunity to serve their country in this contest.

In the first place, we submit that the land-grant colleges are competent to give young men the general and the scientific education required for officers. They have admirable courses in English, history, mathematics, chemistry, physics, and the various branches of engineering required. In many of these institutions the student can get as fine training in mathematics as he can get at West Point, and in the majority he will receive much better practical education in the sciences and in civil, mechanical, and electrical engineering. These colleges have better laboratories and shops and larger facilities in sciences and engineering than have either West Point or Annapolis. In many cases their methods are more modern and their endowments far greater. Their military departments are, as a rule, in charge of the most competent class of men to be found in the Regular Army. The Inspector-General says of those detailed to the colleges in 1897-98: "Eighty-one of them were graduates of West Point, 20 had graduated from the army service schools, 21 were captains, and 70 were first lieutenants; 53 of them had twenty years of service or over to their credit, 20 had served between fifteen and twenty years, 29 between ten and fifteen years." With the proper encouragement and with modern equipment it is evident that these officers could supplement the general and scientific training of the land-grant colleges with the best possible military instruction.

For the want of records it has been impossible to get accurate figures as to the number of young men who have had a regular course of instruction in military science or have been trained in military tactics in these land-grant institutions. There were no regular inspections by the War Department until 1887. Since that time reports have been made showing the number of students under military instruction, and from these data we learn that about 75,000 young men have, during the last ten years, received at least one year's instruction and practical training in military science and tactics in the land-grant colleges—enough to form nearly one-half of the Volunteer Army called out during the Spanish-American war.

The same reports show that during the last ten years about 1,800 picked young men, who held positions as cadet captains, lieutenants, etc., while at college, have been graduated from the military departments of these institutions. In the opinion of the Inspector-General many of them "are fairly well prepared to assume the functions of officers of volunteers." The same reports show, again, that the land-grant colleges having military departments had, during the session 1897-98, 541 cadet commissioned officers, 1,376 noncommissioned officers, and a total of 8,341 cadets under instruction, or enough for about three brigades. This was at the close

of the session, and probably represents the minimum strength of the college battalions for that session. An appeal to the Inspector-General's Office for assistance in collecting data with regard to the services of these colleges in the war was cordially responded to, and it is in large part due to the courtesy of his office that I am enabled to submit the following report. Considerable additional data were also obtained through direct correspondence with the presidents of colleges. The blanks used by me corresponded to those sent out from the office of the Inspector-General, so that all of the data were brought together in the same table.

The tables submitted show, first, the actual strength of the military departments of these colleges during the spring term of 1898; secondly, the number of officers and men supplied by them for the Regular and Volunteer armies during the war with Spain. The blanks sent out asked for detailed statements of the strength of their battalions during the spring term; the number of organizations mustered into the Volunteer Army in a body; the number of students of the session of 1897–98 individually commissioned in the Volunteer Army during the war with Spain; the number individually enlisted in the Volunteer Army in addition to the above; the number commissioned in the Regular Army, and the number enlisted in the Regular Army. I also sought to obtain accurate statements with regard to the alumni and former students commissioned in the National Guard before the war and in the Volunteer Army during the war, and also the number holding commissions in the Regular Army before the war with Spain, and the number commissioned during the war with Spain. Forty-two land-grant colleges having military departments sent in reports either to the Inspector-General or to myself, which are more or less complete. These reports are entirely complete as to the strength of their organizations during the spring term, fairly complete also as to the number of students of last year's session commissioned or enlisted in the Regular and Volunteer armies, but, unfortunately, quite incomplete as to the number of alumni and former students who served in the Regular and the Volunteer armies during the war. We regret to say that only a few of the colleges appear to have made any effort to make rosters of their students in the war. Those who have tried to do so, like the University of Tennessee, have found the investigation very interesting and profitable. We would urge all of these colleges to go to work speedily to make rosters of all of their students, especially of the commissioned officers, who served during the war, before it is too late. The reports received give us, however, much valuable information. They are fairly complete as to the services rendered by the students of 1897–98, and, though far inside of the truth, the figures showing the services of alumni and former students are very impressive. Let us examine some of the results of the investigation.

As reported above, many whole battalions and companies offered their services for the war. A few were accepted. Among them were the following: A company from the University of Missouri formed Company I, Fifth Missouri Volunteers; a company from the University of Idaho became Company D, First Regiment of Idaho Volunteers; a company from the State Agricultural College of Kansas became Company H, Twenty-second Regiment of Kansas Volunteers; a company from the Agricultural College of South Dakota entered as Company K, South Dakota Volunteers. These are merely illustrations. Many students of the land-grant colleges who could not gain admission to the Army as companies returned to their counties and enlisted there. There is thus ample evidence that the military training received in the colleges stimulated the military spirit and did much to assist in the organization of the volunteer regiments of all the States. The State of Tennessee may be taken as an illustration. The commandant at the University of Tennessee was appointed colonel of the Fourth Tennessee Volunteers, and was instrumental in obtaining commissions as captains and lieutenants for 22 of his former students, mostly graduates of the military department. The colonel of the Sixth United States Volunteers was another commandant of the University of Tennessee, and about 20 young officers rallied to his support. These young men took, of course, hundreds of former students with them as enlisted men. In addition to these, all of the Tennessee regiments were officered very largely from the ranks of the former graduates of the military department of the University of Tennessee. From its battalion of 1897–98 the University of Tennessee supplied 14 commissioned officers and 17 noncommissioned officers for the Volunteer Army. Twenty-nine of its younger alumni received commissions in the Volunteer Army and 70 in the Regular Army. In all, this university was represented in the Regular and Volunteer armies by 3 colonels, 3 majors, 3 staff officers, 5 captains, 14 first lieutenants, and 21 second lieutenants, making a total of 49 commissioned officers. It had in addition thereto, in the Navy, 1 commander, 2 engineers, 1 lieutenant, 1 lieutenant (junior grade), and 2 ensigns. Three University of Tennessee men were in the battle of Manila. Commander Maynard, who fired the first shot and captured the first prize of the war and was wounded while cutting the cable at Cardenas, was a student of this institution. This university had 6

alumni in the battles around Santiago, 2 of whom were killed on the firing line. Over 100 students went from the Missouri State University as volunteers. They ranked from major and surgeon to private. The commandant reports that over 300 Cornell students of 1897–98 were in the war, and 75 per cent were either commissioned or noncommissioned officers, etc.

As was explained above, comparatively few students were received into the Volunteer Army in their original organizations. Still we find that 201 students of these 42 land-grant colleges during 1897–98 entered the Volunteer Army in their own organizations. These companies had 10 officers and 35 noncommissioned officers. For evident reasons the college records are incomplete for the number of enlisted men, and also for the number of commissioned officers. Still we have reliable records, as will be seen from Table I, of 362 students in these 42 colleges during 1897–98 commissioned in the Volunteer Army and of 1,085 enlisted in the Volunteer Army. The number of students of that session commissioned in the Regular Army during the war with Spain was 37, and the number of men known to have enlisted in the Regular Army was 75. Only 29 out of the 42 land-grant colleges report the number of their alumni in the war, but these 29 give totals of 439 commissioned in the Volunteer Army and 38 commissioned in the Regular Army. If the other 13 colleges keep up the same proportion, all these colleges supplied from their alumni over 750 commissioned officers for the Regular and Volunteer armies during the Spanish war. In addition to these, the colleges report 56 of their alumni in the Regular Army and 166 in the National Guard before the war with Spain. It may fairly be supposed that all of these went into the war. Adding together the alumni in the Regular Army, in the National Guard before the war, those commissioned during the war, and the number of students of the session of 1897–98 commissioned during the war, we get a grand total of 1,345 officers in the Spanish war who received their military training in the land-grant colleges. We know to a certainty that this is far inside of the truth, because of the incompleteness of the lists of alumni and former students of the colleges. In other words, out of 11,108 officers of the Regular and Volunteer armies in the month of August last, 1,345, or over 10 per cent, were educated at the land-grant colleges. The Inspector-General reports that 1,800 represents the number of honor graduates of their military departments available at the present time for the service. It is evident, therefore, that they could have supplied from students and alumni together at least four or five thousand excellent young officers.

It is thus shown that the land-grant colleges are prepared to supply competent officers for the Regular Army. Their students represent the best there is in the country. War has become in these times chiefly a matter of science, engineering, and money. Nowhere can better young engineers or scientific men be found than in these great national schools of science and industry. They are the people's colleges, originated, founded, and supported in large part by the people, and it should be both their duty and their privilege to train men for the service of the country in the time of need.

Besides the 42 land-grant colleges there are about 60 other colleges in the country which give military instruction and report to the War Department. They include all classes of institutions, from great State universities and denominational colleges to small boys' schools. Forty institutions out of the 60 have made similar reports, which have been compiled in Table II.

The strength of their military departments and their representation in the war was as follows:

During the spring term of 1897–98 these 40 colleges had 386 cadet officers, 875 noncommissioned officers, and 3,746 privates, making a total of 5,007 students under military training.

Very few of their organizations were accepted as such for the war. A number of young men from St. John's College, Maryland, formed Company A, First Maryland Volunteers. Others from Grove City College, Pennsylvania, formed Company F, Fifteenth Pennsylvania Volunteers. A company from the Ouachita College formed Company H, First Arkansas Volunteers. In all, 173 students of 1897–98 received commissions and 1,022 enlisted in the Regular and Volunteer armies. The same institutions were represented in the Regular and Volunteer armies and the National Guard by 664 alumni.

All the college presidents were asked whether, in their opinion, the military instruction assisted in the advancement of their alumni and students in the Army. The replies indicate that they are almost unanimously of the opinion that it did.

Such are some of the results of my investigation of the military service of 42 land-grant colleges and 40 out of 60 other colleges having military departments in charge of army officers.

The general results may be summarized as follows:

Strength of military colleges during the spring term of 1897–98.

	Land-grant colleges.	Other colleges.	Total.
Cadet officers	572	386	958
Cadet noncommissioned officers	1,456	875	2,331
Privates	6,996	3,746	10,742
Total	9,024	5,007	14,031

The 82 colleges reporting had thus enough students under arms to make a full army corps in the Spanish war.

Representation in the Spanish war—alumni and students.

	Land-grant colleges.	Other colleges.	Total.
Commissioned officers	1,092	837	1,929
Noncommissioned officers and privates (incomplete)	1,303	1,022	2,325
Total	2,395	1,859	4,254

The figures for noncommissioned officers and privates are only for those known to the college officers, and are far inside of the mark; those for commissioned officers are also quite incomplete, although they are more likely to be heard from.

If the other 20 colleges keep up the same proportion, it is clear that the number of commissioned officers in the Spanish war educated at these colleges will not fall below 2,500. In other words, out of 11,108 officers in the Regular and Volunteer armies in the month of August last nearly 25 per cent were educated in military science at the colleges having army officers. About 1,200, or less than 12 per cent, were educated at West Point. The other 63 per cent had received no college training in military science at all—a very unfortunate fact, and one worthy of the serious consideration of our lawmakers. Possibly these officers may have received some training in the National Guard, but how much and what kind? After what we saw of their work last summer, are we willing to trust our men in the care of officers with no more training than this? Is not this the root of our whole trouble—a want of military educated officers? How can we better educate them than at these land-grant and other military colleges, which, in this war, have by their fruits—their sons—so gloriously proved their right to exist?

Our present Regular Army consists of 42 regiments, of 504 companies, batteries, or troops. Such an army requires, under the existing organization, 1,600 junior officers (captains and lieutenants). The Adjutant-General advises in his report that this be increased by at least one to each company, battery, or troop. The general commanding recommends a minimum standing army of at least 92,000 men. This would require about 3,000 junior officers. Where shall we get them if not from the land-grant and other military colleges? And when we have officered our greater Army for the first time, where shall we get the men to keep up its personnel hereafter? It will require at least 208 new second lieutenants each year to do this. West Point, as at present organized, can only supply from 40 to 50 a year. Where shall we get the remainder? Less than 1,200 officers in our present Army were educated at West Point.

Does not the experience of this year teach us that we must maintain an organization of officers sufficient for an army of at least 300,000 men? Our wretched unpreparedness and want of a sufficient number of experienced officers came, as we all now know, very near ruining our cause last summer. Had it not been for the splendid bravery of our men and the gallantry and skill of some of our officers at El Caney and San Juan we might still be engaged in a most distressing war. The lesson of this war is that in future we must be better supplied with material equipment of all kinds, but especially with experienced officers to command our volunteers. A great nation like ours can easily prepare and store away all the arms and military supplies that will be needed; but how are we going to educate and train the officers to organize, drill, and lead our volunteers? It will not be sufficient merely to give them a college education. We may build a dozen West Points or maintain a hundred military colleges like the present land-grant colleges, but if we turn the young men out after graduation the Government will soon lose all the advantage of their education. In order to make them efficient officers we must give them the opportunity

to keep up their military training and to get experience in caring for and handling men. How shall we do this?

The failure of the National Guard in many of our States was a matter of surprise and mortification; but when we consider that in a majority of the States their officers had had no experience whatever in field work or even in the occasional encampments, which are little better than picnics, we can not blame them. Men can not be expected to do at once with accuracy and facility that which they have never had an opportunity to learn to do. If we would have a reserve of experienced officers we must take the young men from the colleges and give them practical training. When we consider that there was no prize at the end of the course and no special opening for the young man who took it, it is truly wonderful that so many of the graduates of these colleges were prepared and ready to serve their country in this war. What the student needs is an incentive to take the special course in military training, through which he will become qualified to serve his country. This might be accomplished by giving them special diplomas as military graduates, which would entitle them to commissions in time of war, brevet commissions in the National Guard of the States, actual commissions in the National Guard, or commissions as officers of a national reserve. Some of them should be given appointments in the army-service schools, where they could get advanced professional training. Certainly we can not expect these young men to pay any further attention to military matters after graduation unless they are encouraged to do so. This, then, is the problem before Congress. The land-grant and other military colleges are already turning out a sufficient number of noble young men who have had the preliminary military training. A method must be found to keep up their interest in military science and give them the experience necessary to make them efficient officers.

The following measures have been suggested to this end:

First. Give commissions in the Regular Army to all the honor graduates from the military colleges (say two or three from each college each year). This prize at the end of the course would promote a healthful competition among all the military students and do much to keep up the interest of all. Send these young men to the army-service schools for further training, and then take them into the Army.

Secondly. Reorganize the National Guard or establish a national reserve. The National Guard should be regularly inspected by the War Department, and an appropriation sufficient should be made large enough to permit of frequent encampments and maneuvers of sufficient length to give the officers and men good training in the field. The difficulties of joint cooperation between the National Government and the States may be so great, however, as to render this plan impracticable. In that case the only solution will be a national reserve army, officered by the graduates of these colleges and drilled at regular intervals.

Some of the minor needs of these colleges will have to be provided for also before the best results can be obtained. Few of the colleges have armories. These must be provided, so that the drill can go on at regular intervals during the bad winter weather. Few of them have sessions in the summer time, and without armories they lose at least one-third of the regular session from drill.

The colleges should be furnished with modern arms and equipments. It is certainly absurd to drill cadets with old Springfield rifles and muzzle-loading guns that they will never be called upon to use. They should have the best guns and accouterments of all kinds, and be provided with ordnance supplies in sufficient quantity. Cadet officers can not be expected to purchase side arms, and these should therefore be supplied by the Government. A noncommissioned officer, competent to take care of the military equipment, should be detailed from the Regular Army to each college. The armory furniture, gun racks and other furniture, repair tools, and supplies should be provided. Band instruments, flags, and all other military equipment should be supplied by the Government. It is something of a hardship to the students of these colleges to have to purchase uniforms in addition to regular clothing. Uniforms should either be supplied or the colleges should at least be permitted to purchase them from the Government contractors at Government rates. This would save the cadets a good deal of money. A small appropriation should be made for contingent expenses and other things that will have to be purchased at the place.

In conclusion, we respectfully submit that the time has come when the Government should recognize the military departments of these colleges as actual military colleges. The military department can no longer be regarded as a plaything. These colleges deserve, both by reason of their services and the needs of the nation itself, to receive the careful attention and earnest support of Congress.

TABLE I.—*Statement showing military service of students and alumni*

State.	Institution.	Strength of military organization of college before the war.				Number mustered into the Volunteer Army in a body.			
		Officers.	Noncommissioned officers.	Privates.	Total.	Officers.	Noncommissioned officers.	Privates.	Total.
Alabama	State Agr. and Mech. College	19	38	238	295	0	0	0	0
Arkansas	Ark. Industrial University	23	57	200	280	0	0	0	0
California	University of California	33	109	431	573	0	0	0	0
Colorado	The State Agr. College of Colo	11	33	193	237	0	0	0	0
Delaware	Delaware College	7	14	58	79	0	0	0	0
Florida	Florida Agricultural College	14	24	111	149	.....	.....	.....	.....
Georgia	Georgia State College of Agr. and Mech. Arts.	.....	.....	.....	.....	.....	.....	.....	.....
Idaho	University of Idaho	8	16	101	125	1	4	28	33
Illinois	University of Illinois	15	32	320	367	.....	.....	.....	.....
Indiana	Purdue University	28	52	190	270	0	0	0	0
Iowa	Iowa State College of Agr. and Mech. Arts.	20	36	100	156	.....	.....	.....	.....
Kansas	Kansas State Agr. College	14	42	144	200	1	3	10	14
Kentucky	Agr. and Mech. College of Ky	19	50	160	229	.....	.....	.....	.....
Louisiana	Louisiana State Univ. and Agr. and Mech. College.	15	31	117	163	.....	.....	.....	.....
Maine	The University of Maine	28	53	142	223	0	0	0	0
Maryland	Maryland Agr. College	11	13	80	104	0	2	3	5
Massachusetts	Mass. Agr. College	8	32	49	89	0	2	5	7
Do	Mass. Inst. of Technology	12	20	243	275	.....	.....	.....	.....
Minnesota	The University of Minnesota	23	64	456	543	.....	.....	.....	.....
Mississippi	Miss. Agr. and Mech. College	16	40	229	285	.....	.....	.....	.....
Missouri	School of Agr. and Engineering of the University of Missouri.	12	23	153	188	3	12	60	75
Montana	The Montana College of Agr. and Mech. Arts.	6	21	72	99	.....	.....	1	1
Nebraska	Industrial College of the University of Nebraska.	18	67	213	298	.....	.....	.....	.....
Nevada	Nevada State University	10	19	110	139	.....	.....	.....	.....
New Hampshire	The N. H. College of Agr. and the Mechanic Arts.	4	11	52	67	.....	.....	.....	.....
New Jersey	Rutgers Scientific School	1	32	64	97	.....	.....	1	1
New York	Cornell University	24	72	317	413	.....	.....	.....	.....
North Dakota	North Dakota Agr. College	3	12	51	66	.....	.....	.....	.....
Ohio	Ohio State University	19	67	203	289	.....	.....	.....	.....
Oregon	Oregon State Agr. College	10	31	98	139	.....	.....	.....	.....
Pennsylvania	Pennsylvania State College	17	36	200	253	0	0	0	0
Rhode Island	Rhode Island College of Agr. and Mechanic Arts.	4	18	49	71	.....	.....	.....	.....
South Carolina	Clemson Agr. College	14	44	372	253	0	0	0	0
South Dakota	South Dakota Agr. College	8	22	140	170	4	7	22	33
Tennessee	University of Tennessee	12	30	115	157	.....	.....	.....	.....
Texas	State Agr. and Mech. Col. of Texas	13	40	244	297	.....	.....	.....	.....
Utah	The Agr. College of Utah	8	18	214	240	.....	2	10	12
Virginia	Va. Polytechnic Institute	28	48	160	228	.....	2	10	12
Washington	Wash. Agr. College and School of Science.	4	9	30	43	1	1	6	8
West Virginia	West Virginia University	12	25	88	125	.....	.....	.....	.....
Wisconsin	University of Wisconsin	23	26	453	512	.....	.....	.....	.....
Wyoming	University of Wyoming	6	19	36	61	.....	.....	.....	.....
	Total	572	1,456	6,996	9,044	10	35	156	201

of land-grant colleges, especially during the war with Spain.

Number mustered into the Volunteer Army in a body.	Number who individually joined Volunteer Army during war.		Number who individually joined Regular Army during war.		Number of alumni commissioned during the war.		Number of alumni commissioned before the war.		Did the military instruction assist in advancement in the service?
Organization in the Volunteer Army in which these cadets served.	Commissioned.	Enlisted men.	Commissioned.	Enlisted men.	Regular Army.	Volunteer Army.	Regular Army.	National Guard.	
.....	33	35	1	0	1	33	3	3	Yes.
.....	.....	24	1	1	3	14	2	.....	Yes.
.....	22	25	3	13	3	12	12	30	Yes.
.....	0	15	1	4	1	1	0	0	No.
.....	9	18	0	0	1	10	1	1	Yes.
1st Florida Regiment	5	(1)	2	25	(1)	(1)	0	(1)	Yes.
.....	1	.....	1	.....	4	20	.....	.....	
Co. D, 1st Regiment Idaho Volunteers.	0	3	2	3	1	1	0	0	Yes.
.....	.....	16	1	1	.....	(2)	.....	(2)	Yes.
.....	0	20	.....	.....	1	.....	.....	.....	
.....	2	45	3	5	3	18	3	15	Yes.
Co. K, 22d Reg. Kans. Vols., K. S. A.C. quota.	0	(2)	1	.....	.....	2	4	1	Yes.
.....	11	4	.....	.....	1	.....	.....	.....	Yes.
.....	2	5	1	.....	2	21	5	.....	Yes.
.....	0	35	2	0	0	4	0	5	Yes.
Nat'l Guard and Regular Army	.....	(1)	2	(1)	(1)	(1)	(1)	(1)	Yes.
Batteries in 1st Reg. Mass. Vols	0	21	0	0	0	0	3	2	Yes.
.....	.....	23	.....	1	.....	55	7	39	
.....	24	107	4	4	1	.....	.....	.....	Yes.
1st, 2d, and 3d Miss. Regiments	28	107	1	(1)	1	28	0	(3)	Yes.
Co. I, 5th Mo. Vols	10	20	.....	.....	1	13	.....	17	Yes.
1st Reg. Mont. Vols.....	.....	.....	.....	.....	.....	.....	.....	.....	Yes.
.....	29	145	1	3	1	11	1	1	Yes.
.....	3	10	2	.....	1	1	.....	.....	Yes.
.....	.....	3	.....	.....	.....	.....	.....	.....	
.....	.....	.....	.....	.....	.....	12	1	.....	
.....	60	75	2	.....	5	120	2	.....	Yes.
.....	17	.....	1	.....	.....	.....	.....	.....	Yes.
4th Ohio and Bat'y H.....	35	70	1	2	1	(2)	2	.....	Yes.
.....	2	50	.....	.....	.....	.....	.....	1	
.....	7	28	1	0	1	0	1	.....	
.....	.....	3	.....	.....	2	3	.....	.....	Yes.
.....	4	20	.....	.....	0	3	.....	.....	
Co. K, S. Dak. Vols.....	1	1	0	0	0	3	0	8	Yes.
6th U. S. Vols. and 4th Tenn. Vols....	13	17	1	(1)	.....	29	7	26	Yes.
.....	26	51	1	1	1	19	1	.....	
Band, 2d Va. Reg	.....	40	.....	10	.....	3	1	4	Yes.
1st Wash. Vols.....	.....	3	.....	.....	.....	.....	.....	1	Yes.
1st and 2d Regs. W. Va. Vols.....	16	19	1	1	1	.....	.....	.....	Yes.
.....	.....	15	.....	.....	.....	.....	.....	.....	
.....	2	12	1	1	1	1	.....	12	Yes.
.....	362	1,085	38	75	38	439	56	166	

[1] Not known. [2] Quite a number. [3] Largely officers.

TABLE II.—*Statement showing military service of students and alumni of col-*

State.	Institution.	Strength of military organization of college before the war.				Number mustered into the Volunteer Army in a body.			
		Officers.	Noncommissioned officers.	Privates.	Total.	Officers.	Noncommissioned officers.	Privates.	Total.
Arkansas	Ouachita Baptist College	4	12	94	110	2	3	16	21
California	Mount Tamalpais Military Acad	6	10	54	70	0	0	0	0
Florida	East Florida Seminary	3	8	32	43	0	0	0	0
Illinois	Western Military Acad	7	16	57	80	0	0	0	9
Do	N. Western Military Acad	4	13	48	65	0	0	0	0
Indiana	Culver Military Academy	16	18	121	155	----	----	----	----
Iowa	State Normal School	16	49	262	327	----	----	----	----
Do	State University	18	35	154	207	----	----	----	----
Kansas	Baker University	4	23	124	151	----	----	----	----
Do	St. John's Military School	4	10	40	54	----	----	----	----
Kentucky	Central University	8	13	70	91	----	----	----	----
Maryland	St. John's College	10	23	68	101	3	2	8	13
Michigan	Michigan Military Acad	13	20	70	103	----	----	----	----
Minnesota	Shattuck School	12	28	125	165	----	----	----	----
Mississippi	St. Thomas' Hall	3	9	41	53	0	0	0	0
Missouri	St. Louis University	15	44	107	166	----	----	----	----
Do	Wentworth Military Acad	8	18	93	119	0	0	0	0
Do	Kemper School	7	12	54	73	0	0	0	0
Nebraska	Doane College	4	11	44	59	----	----	----	----
North Dakota	University of N. Dakota	11	16	88	115	----	----	----	----
New York	Fairfield Military Acad	8	23	48	79	----	----	----	----
Do	St. John's College	15	45	208	268	----	----	----	----
Do	Clinton Liberal Institute	5	11	36	52	----	----	----	----
Do	De La Salle Institute	20	30	128	178	----	----	----	----
Do	Col. of St. Francis Xavier	23	46	177	246	0	0	0	0
Do	New York Military Acad	9	10	68	87	----	----	----	----
Do	River View Academy	7	22	115	144	----	----	----	----
Ohio	Normal University	22	51	230	303	----	----	----	----
Do	Wilberforce University	1	33	80	114	1	5	8	14
Do	Military Institute	3	7	28	38	----	----	----	----
Do	Denison University	13	25	54	92	----	----	----	----
Oregon	Bishop Scott's Academy	10	19	50	79	----	----	----	----
Pennsylvania	Grove City College	15	35	160	210	3	12	35	50
Do	Franklin and Marshall College	6	18	52	76	----	----	----	----
Rhode Island	Brown University	14	36	131	181	----	----	----	----
South Carolina	South Carolina Military Acad	----	----	----	120	----	----	----	----
South Dakota	University of S. Dakota	10	10	105	125	----	----	----	----
Vermont	Norwich University	8	10	35	53	----	----	----	----
Virginia	Virginia Military Institute	15	32	184	231	----	----	----	----
Wisconsin	St. John's Military Acad	9	24	111	144	----	----	----	----
	Total	386	875	3,746	5,007	9	22	67	98

leges other than land-grant institutions, especially during the war with Spain.

Number mustered into the Volunteer Army in a body.	Number who individually joined Volunteer Army during war.		Number who individually joined Regular Army during war.		Number of alumni commissioned during the war.		Number of alumni commissioned before the war.		Did the military instruction assist in advancement in the service?
Organization in the Volunteer Army in which these cadets served.	Commissioned.	Enlisted men.	Commissioned.	Enlisted men.	Regular Army.	Volunteer Army.	Regular Army.	National Guard.	
Co. H, 1st Ark. Vol. Inf	.....	2	.....	.....	.....	1	.....	.....	
.....	0	0	0	1	0	0	0	1	Yes.
.....	7	15	0	1	0	7	1	20	Yes.
.....	0	16	0	0	2	6	1	3	Yes.
.....	3	18	1	1	1	3	.....	29	
.....	.....	3	.....	3	.....	.....	.....	.....	
.....	.....	40	.....	.....	2	2	.....	2	Yes.
.....	.....	.....	.....	100	.....	.....	.....	.....	
.....	6	6	.....	.....	.....	3	1	.....	
.....	5	10	0	0	0	0	0	1	Yes.
.....	5	15	2	3	1	.....	.....	.....	Yes.
Co. A, 1st Reg. Md. Vols	10	15	1	.....	1	13	2	2	Yes.
.....	.....	1	.....	.....	2	24	4	75	Yes.
.....	38	33	9	4	9	38	13	25	
.....	3	12	1	0	1	8	0	1	Yes.
.....	.....	.....	.....	.....	1	.....	.....	1	Yes.
.....	0	2	0	0	2	21	0	8	Yes.
.....	.....	3	0	0	0	3	0	0	
.....	.....	1	.....	.....	.....	1	.....	1	
.....	2	.....	1	.....	1	1	0	1	Yes.
.....	6	20	.....	3	.....	6	.....	4	
.....	.....	.....	.....	.....	.....	.....	.....	.....	Yes.
.....	.....	.....	.....	.....	.....	.....	.....	.....	
.....	3	10	3	.....	1	4	5	2	Yes.
.....	0	0	0	0	0	2	0	2	
.....	.....	100	.....	.....	5	9	13	.....	Yes.
.....	.....	24	.....	.....	5	13	8	9	Yes.
.....	21	400	3	11	3	17	4	.....	Yes.
A part of 9th Battalion Ohio V. I	0	0	0	1	0	1	2	1	Yes.
.....	1	10	1	2	1	1	0	1	Yes.
.....	.....	.....	.....	.....	.....	.....	.....	.....	Yes.
.....	8	24	4	4	5	8	4	15	
Part of Co. F, 15th Pa. Vols. Some in 10th, 16th, and 18th.	.....	.....	.....	.....	.....	4	.....	1	Yes.
.....	.....	10	1	.....	.....	.....	4	.....	Yes.
.....	4	20	.....	.....	.....	.....	1	.....	Yes.
.....	.....	.....	.....	.....	2	10	2	.....	Yes.
.....	9	4	1	.....	1	1	0	.....	Yes.
.....	.....	6	.....	.....	1	10	5	5	Yes.
.....	.....	.....	.....	.....	10	71	14	.....	Yes.
.....	3	43	2	.....	2	1	2	10	
.....	134	799	30	134	59	289	86	230	

The paper was discussed by A. Ellis, who spoke of the limited military equipment possessed by the land-grant colleges, notably that of Colorado, and deplored the fact that so little recognition was given the military companies of the colleges in the war with Spain. He said it was very difficult for his students to get into the Army even as privates, although some of them had had three or four years' rigorous military training and had commissions as captains and lieutenants. He urged a closer connection between the War Department and the military departments of the land-grant colleges.

A. W. Harris offered the following resolutions, which were adopted:

Resolved, That there be appointed a committee to consider the organization and extent of military work which can be properly undertaken by the land-grant colleges and the proper relation of this work to the military service of the several States and of the United States;

That this committee, in conjunction with the executive committee of the Association, be empowered to propose and secure if practicable such legislation as may be necessary to carry out the conclusions which the committee may reach;

That the committee consist of seven persons, of whom the president of this Association shall be one.

The committee subsequently appointed in conformity with the resolutions was G. W. Atherton, A. W. Harris, C. W. Dabney, A. Cope, H. H. Goodell, R. H. Jesse, and the president of the Association, H. C. White.

The resolution of I. H. Butterfield (p. 54) relating to military instruction in land-grant colleges, was, on recommendation of the executive committee, referred to this committee.

G. W. Atherton presented the report of the committee on the president's address, as follows:

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS.

The committee to which was referred the president's address respectfully presents the following report:

The brief time which could be given to a proper consideration of the address in the midst of many pressing engagements precludes the possibility of doing more than to express a general but unqualified assent to the views so ably set forth by the president of the Association, and the committee submits to the Association without argument the following resolutions as a brief expression of its views and as a platform upon which the institutions here represented may confidently take their stand:

(1) That the proceeds of the United States land-grant act of 1862 and the annual appropriations provided for by the acts of Congress of 1887 and 1890 are a national trust, to be administered by the several States in strict accordance with the letter and the spirit of the grant.

(2) That the land-grant colleges, whether organized separately or as branches of State universities, are primarily educational institutions, required by law to teach certain branches of learning.

(3) That these branches of learning are to be taught with special reference to their "applications in the industries of life."

(4) That this requirement involves a thorough fundamental training in the principles of the mathematical, physical, and natural sciences, in order that their practical applications may be clearly understood, and forbids that the institutions shall in any way be regarded as "trade schools."

(5) That the land-grant colleges are required by law to provide a "liberal" as well as a "practical" education, and that it is therefore their special duty to study, practice, and develop sound principles of instruction in the teaching of all branches of learning, both liberal and technical, to the end that the subjects taught may be made the means and instruments of a true education, as well as a means of acquiring a body of concrete knowledge.

(6) That the aim of all research should be to learn the truth, and the aim of all teaching to teach the truth and nothing but the truth; and that to this end freedom of research and freedom of teaching are indispensable.

(7) That all teaching should accordingly be absolutely free from partisan or sectarian bias, that the institutions should be free from partisan or sectarian control, and that no interference in the administration or in the teaching or in the tenure of office should be allowed on partisan or sectarian grounds.

GEO. W. ATHERTON.
J. E. STUBBS.
R. H. JESSE.
E. A. BRYAN.
J. K. PATTERSON.

The report was adopted.

H. H. Goodell. There was referred to the executive committee this morning the report of a committee of the Section on Horticulture and Botany, with reference to a subcommittee on nomenclature of fruits. The executive committee believes that this matter belongs to the section entirely, and therefore does not report any recommendations to the Association.

The report of Mr. Goodell was adopted and the matter referred to the Section on Horticulture and Botany.

On motion, the convention took a recess until 3 o'clock p. m.

Afternoon Session, Thursday, November 17, 1898.

At 3 o'clock the convention resumed its session, President White in the chair.

O. L. Waller, of Washington, presented a paper from the Section on Mechanic Arts on "What shall be the character of the preparatory work required to enter four-year engineering degree courses?"

What Shall be the Character of the Preparatory Work Required to Enter Four-Year Engineering Degree Courses.

Since the preparation is the foundation for what is to follow, we can hardly determine what the preparation should be until we have some settled idea of what we aim at.

We ought first to determine what the finished product is to be before we undertake to fix limits to our preparatory work. Are we agreed upon an ideal? I will not attempt an answer to this question; yet I scarcely believe such an agreement has been reached, and if it has, certainly the curriculum designed to produce it has not. I shall, however, assume in this case that we aim to turn out a well-trained, equally poised unit, a tall arch, strong in all its parts, resting on the abutments of a splendid physical development and a far-reaching mental grasp, closed with the key of unchallenged morals. And since the education we are discussing, when completed, is to come from the field of the mechanic arts, I shall assume that the mental furniture of our unit has been gathered from that environment; that his concepts are from the field of the natural sciences; that he has large capacity for interpreting and reporting nature from nature herself; that he is a good assimilator of what others have reported, is strong in the initiative, not a follower but a leader, full of unconscious sturdy self-reliance.

It should be our purpose to make men and women strong in the creative function. The power of thought and action should be preeminent. We want a potential boy.

I would account him a failure whose assimilating capacity has absorbed his whole life and whose inventive faculties still lie dormant. Our concepts of the world, if built on the report of another, must be very unreal, vague, and shadowy, lacking reality and detail, and can not be very useful to their possessor. In so far as possible we want our freshman to have a love, a growing appetite, for the real world. We should prefer that he had studied nature rather than books. The stimulus that makes him react most powerfully will come from that source. We would be sure then that his sense organs were keen and correctly reported his environment. His success in life will depend on this function being accurately performed. He should be able to direct his own actions; we would not leave him to pick his way through life by reading signboards, but would have him put up a few for those less fortunate than himself to read. He should have established habits of accuracy and must have the patience to know that he is right, the ability to refer everything to first principles. It is not enough that he be pretty near right, that he approximate things, but he should have acquired a large factor of precision. His conclusions and statements must not be in doubt; he must know that they are right and be able to defend them with incontrovertible logic. We want individualism; that kind of spontaneous individualism so marked in young children of such inestimable value to its possessor, yet so wantonly crushed in many of our primary schools.

We want a scientific spirit in our candidate for admission. It is not so necessary that he know many facts, as it is that he know how to acquire scientific data and have the spirit and habit of an investigator. He will likely acquire this proficiency better by the longer and more careful study of one science than by the study of several. For our purposes we would prefer that he establish that condition of mind by the study of chemistry or physics. He should there acquire concepts quite as valuable as the method he would assimilate.

I do not care to discuss the relative merits of the several branches usually laid down in preparatory courses, but it would appear to me that it made little difference through what channel our evolved boy came just so he be not tardy in the coming. For, after all, is not a man as well educated whose precepts are scientific

and industrial, provided he is as rich in them as the man whose precepts are from the languages or the humanities? The former individual would at least be more materialistic and constructive in his habits and methods. In either case we might have a potential man, yet, if he is to enter the field of the mechanic arts, there is a large difference from what field or environment he acquires his stored energy. So far as his future study is concerned his advancement will be more rapid, more stable, and comprehensive if he has handled the material world sufficiently to understand some of its principles and limitations.

If he is to be self-reliant, he must either have a correct scientific method on entering college or acquire it after entrance. What we get out of a fitting school is an evolution, the product of an intellectual environment. Professional life largely gets its stimulus from the work of our early school life. The impressions that we take with us were recorded then. The motor nerves were then habituated; in a word, the organism was prepared for the intellectual life, and the intellectual and ethical equipment pretty well determined once for all.

The acceleration of after life finds its source in the early acquired ability to gather force from nature and to gather it without lost motion. This can only be reached when the entire youth is made to vibrate in unison with nature when the entire boy is put to school. How can we make the outer world react strongest upon the consciousness of the child? I do not mean how shall the world react upon his intellect alone. I would not forget the physical and ethical factors that are also the products of an environment. If we aim at a model, we should accept only those lines of work that lend themselves to our purpose and discard everything else. What part of the outer world shall we cause to react upon this unit that we are fitting for a course in the mechanic arts? Shall it act directly on him through his senses, and through all of his senses, or only through one or two of them, and that at secondhand? Shall we allow the reaction to be such that he will be dependent upon someone else to do his thinking, or shall it be such as will develop the power of independent thought, and of confidence in the conclusions arrived at?

I regard the habit and method of investigation far more valuable to my applicant for admission than any facts he may have learned, and therefore believe that the study of one or, at most, two sciences in our preparatory schools can give that facility and is therefore sufficient.

He should know how to use the equation as a tool. We don't want algebra that he has had some time in the dim distance with rust on it. Since algebraic analysis is to be the basis of his technical work, it can not be too well digested and assimilated. And here, as in the sciences, we believe in induction. In many instances it may pave the way to more rigorous analysis.

I would have him know number rather than about it. If I may be permitted, I would say that we want concrete mathematics; not something entirely outside of the student's environment and experience, but something that is an integral part of himself; something that he can use with the same proficiency as any organ of the body. What he has not so thoroughly assimilated as to be a potential reality, what he can not make dynamic by an act of the will is useless rubbish, the dust and cobweb of an unused garret.

I would not teach him that kind of grammar and rhetoric that memorizes the rules in class and violates them all the rest of the time. His should be a working knowledge of grammar and, at least, a working knowledge of applied rhetoric. The study of English should make him a user of correct forms and give him facility in expression.

The student should have a working knowledge of his preparatory subjects. They should not be veneered onto him, but should be a part of the fiber of the boy. Possibly in an engineering course, more than in any other, is this true. That part of his education that is not as handy to him as the fork with which he eats lacks something of finish and will be a handicap to him in his technical work. And all such shortage must subtract something from the fullness of his collegiate life and much from his professional life. The preparatory subjects should have nothing in them for show. They may be enumerated under two classes; one to broaden the life and culture of the man, the other to fit him for the serious business of his profession. In history, it is not wars we want, but the history of the civilization of the race; how people lived, what they did, their forms of government, how the world has grown better, how institutions have come up and decayed, how the best has been preserved as a heritage to the race. So much of a general training as is possible should be acquired in the fitting school, for most of the general training will be crowded out in the purely technical course that is to follow.

Science, mathematics, and the English language are the legs to the tripod upon which our engineer must stand. In very many instances his efforts in arithmetic and in algebra are purely machine work. Establish a set of conditions, feed your material into the hopper, and the product turned out will be uniform.

In geometry the matter is usually worse. The theorems may be fairly well memorized, but there the matter ends with a large body of students. They are entirely

lacking in power to reason geometrically, for the reason that they have had no experience in demonstrating propositions at first hand, have solved too few problems geometrically, have learned to rely upon a text, and therefore are weak in invention. He must not only be an assimilator of geometrical facts, but should have a large capacity in applying those already learned in the proof of original and undemonstrated theorems. He must be creative, otherwise he will add nothing to the progress of the world, and at the end of four years in college will come out veneered only—will not be of the same kind of material from center to surface, but a great falsehood and a monument to a vicious system. In many instances it is not even veneer—simply stain. In Tacoma there is a casket maker who makes all kinds of caskets, from bird's-eye maple to quarter-sawed oak, of spruce lumber. The board is made smooth and even like a piece of paper ready for the imprint. If a walnut casket is wanted, he takes a large drum upon which is rolled a thin veneer of walnut, inks it with a stainer, runs the spruce boards through these rolls as if printing a paper. It there receives a coat of stain, is then worked up and polished, and the uninitiated pay their money for real walnut. It takes a careful examination to detect the sham. A college is no place for a veneered boy or one who has only leaned up against the real thing.

In the Washington Agricultural College and School of Science we offer a course in free-hand drawing and one in wood working. Other courses do little to develop the tactile sense, but wood working, and particularly wood turning, give a delicate training to the tactile nerves. Everyone who has done any wood turning remembers how delicate the sense of touch may become and how implicitly he relies upon it to guide him in the manipulation of the chisel. The joinery should make the boy resourceful and give ability in interpreting drawings and a knowledge of the amount of detail necessary in working drawings. It cultivates control of the body movements. The latter applies in a marked degree to free-hand drawing. In this we are educating the muscular organism into confidence and obedience to the will. This organic training is the difference between the boy who is green and awkward in body movements and the one who is graceful. If he should leave before entering college, the organic training received from these courses, the power to express himself in sketches, the ability to put his thoughts into material constructions, must be considered quite as valuable as the same amount of time spent on some informational subject. The acceleration in all of this must be a keen appetite, a love for the thing undertaken. I think it was Agassiz who said that it was the duty of the educator first to create an appetite for knowledge and then to substitute the environment best suited to satisfy it. I believe we do not reach our best effort, in that we limit our contact with the outer world, the source of all our knowledge—to be in harmony with which is to be educated—largely to sight and hearing. We have felt and handled but little of our educational environment. We take the bulk of it at second hand, are too easily satisfied with the report of what someone else has seen. There would be more integrity in our thinking if we had covered fewer subjects, had discovered more for ourselves, and had transformed the bridle path of our tactile senses into a broad highway. This would add potentiality to the boy and give us a nation of leaders. The whole make-up of the boy, from the child to the full-grown man, is a life of intense physical action, which, if directed, might be a powerful engine in his education.

Washington conditions are very different from those in the older States; outside of three or four cities and an academy or two we have no fitting schools. By virtue of this misfortune the colleges must maintain their own preparatory departments, and have only themselves to complain of if the preparation is not satisfactory.

Washington boys may not have come in contact with so many books, magnificent structures, great engineering projects, may not have seen much of the work of the architect and engineer in the construction of great cities, but they have climbed their own native hills, have stood on the mountain top alone, except for the company of snow-capped peaks, and from a clear, sun-lit sky have looked down upon the storm raging below, and with the world shut out they have stood in admiration of the work of the Deity. They have followed the rivers to their mountain sources, have lost themselves in the limitless forests. They have stood among the giants of the wilderness, have observed their rugged trunks, their tops lifted skyward, have counted these great aborigines by the hundred, and in such company have drunk in something of the greatness of nature. In this there is an element of compensation. The environment of the early life of a Western boy certainly does not bring him in contact with the masterpieces of man, but it just as certainly does bring him in contact with some of the masterpieces of the Deity, and I must insist that the latter gives him large notions of things, ideas that will be of material advantage to him when he enters college. It has given him elastic muscles, splendid health, a clear brain, broadened his ethical nature, and made him self-reliant.

Of mechanical contrivances his stock of knowledge is fairly liberal. He has observed the little engine in the warehouse where he has drawn his or his father's

grain; the great traction engine pulling separator, tank, and derrick along the public highway. He has set up and repaired the harvester, the combined header and binder, or has operated the tiller of the latter machine. He has watched the great combined header and thrasher, with its 20-foot cut and 36 horses in one team, heading, thrashing, and sacking 30 to 50 acres of grain per day. In a large number of instances he has worked with some one of these machines and has learned their mechanism. Against the privilege of going into the shops and observing their manufacture, where the real mechanism of the manufacturing machinery could not be studied to a full understanding, the privilege of using, studying, and mastering the manufactured article is surely compensating.

Our students are older; experience has matured them further than those who apply for admission to the colleges of our older States. Their environment has led them nearer to the material side of life, the engineering possibilities of a new country have a large hold upon them. The trend of their schooling would lead them toward an industrial education.

The desideratum of the whole matter is the greatest possible breadth and mental grasp, the power to think independently—to think in things and in phenomena.

The burden of my argument calls for precepts from fields allied to the mechanic arts, for working capacity, and for organic training.

The CHAIRMAN. The next business in order is the presentation of the report of the committee on methods of teaching agriculture.

A. C. TRUE. In the absence of the chairman of this committee, I have been asked, as the secretary of the committee, to present its report.

This committee was appointed three years ago and has thus far made two reports. These have been distinctly reports of progress; that is, the committee has not proposed anything for adoption by the Association, but has simply stated its own views regarding the matters which it had in charge. This seems to be a necessary procedure in view of the nature of its work; for until the committee has gone over the entire subject according to some program which it has laid out it can hardly put the matter in such shape as would enable the Association to take intelligent action. And after all it is not the purpose, as I understand, of the investigation which the committee is making to produce a cut-and-dried program to be followed by all the institutions represented in this Association. The work of the committee is rather to be of a suggestive character, to stimulate thought and inquiry regarding the best methods of teaching the subject of agriculture.

Now this does not by any means rule out the making of a definite program by the committee. In fact, the committee, after looking the matter over, has determined that the best way in which it can serve the Association is by presenting the subject in some definite form that, in our judgment, will give the clearest and most distinct basis for criticism and make the work of the committee available for the use of teachers in our institutions.

As the committee is a body whose members are scattered widely, it is, of course, impossible for them to hold many meetings or to take up any very large portion of their work in any single year. So the reports as they come from time to time must necessarily be of a piece-meal character, and it will be some time before the committee can be expected to cover in any satisfactory way the subjects which they have in hand.

We would also say that in our work we do not confine ourselves to the judgments and opinions of the committee, but so far as practicable in the different lines and subjects we take the advice of those from whom we think we can get the best guidance.

In connection with this work we would call attention to the movement which is going on now in the colleges of agriculture for the improvement of the courses in technical agriculture. I have had the opportunity during the last two years of visiting nearly every agricultural college in the country, and I have been deeply impressed with the rapidity with which the general subject of agriculture is being broken up into different divisions, and provision made for the teaching of the different branches of the subject by teachers who have been trained in specialties. Then there has been a great increase in the facilities for teaching and in illustrative

material. There is also much more attention being paid to the proper housing of the departments of agriculture in the land-grant institutions. So that we feel that the work of the committee and of the Association, looking to the improvement of the methods of teaching, is right in line with a general movement in the colleges for the improvement of the status of their departments of agriculture as branches of instruction.

Mr. True then submitted the following report:

Third Report of Committee on Methods of Teaching Agriculture.[1]

The committee on methods of teaching agriculture submits a third report of progress. The first report[2] contained a brief review of the courses of instruction in agriculture in American colleges and in a few foreign institutions and proposed a tentative plan for the division of agriculture. In its second report[3] the committee attempted to outline the subjects which should be included in a four years' course in agriculture, taking as a basis the subjects adopted by the Association as essential to all courses of like duration on the recommendation of its committee on entrance requirements.

The committee on teaching at that time also presented the following outline for the division of agriculture (in the narrower technical sense of that term as used in courses of study), as follows:

Agriculture (486 hours) shall include:

	Hours.
1. Agronomy, or plant production	132
2. Zootechny, or animal industry	162
3. Agrotechny, or agricultural technology	72
4. Rural engineering, or farm mechanics	60
5. Rural economics, or farm management	60
Total	486

In these reports the term "hours" is used in its scholastic sense for periods of class or laboratory work, and in reckoning the number of hours two hours of laboratory work or practicums are considered the equivalent of one hour of recitation.

In its second report the committee also declared its intention to take up next in detail the topics properly included under the head of "agronomy," "with a view to presenting a syllabus of a course in that subject which shall show with some fullness the topics to be treated, their relative importance, the time which should be devoted to each, and especially the order of presentation which conforms most closely to sound pedagogical principles."

This purpose the committee has in a measure fulfilled by its work during the year, and presents its report in three divisions, as follows:

(1) A syllabus defining the limits of a course in agronomy and stating the topics included in agronomy in the order in which they should be presented to students, i. e., in their logical and pedagogical order.

(2) A series of lecture or chapter headings showing how the syllabus for agronomy may be applied in preparing a course of lectures or a text-book on this subject, covering 99 class-room hours or periods of sixty minutes each, i. e., three lecture or recitation periods a week.

(3) A series of subjects for practicums or laboratory exercises to be used in connection with the class-room work in agronomy and covering the thirty-three remaining hours or periods (equivalent to sixty-six hours of sixty minutes each) assigned to the course in agronomy, i. e., one practicum per week.

It has been the object of the committee to make such an outline of this course as can easily be adjusted to the requirements of institutions with different organization and environment. While the syllabus is intended to limit the range of subjects which may properly be included under agronomy, the amount of attention which shall be given to particular topics will vary according to circumstances. The series of chapters and practicums are in a measure intended simply to show a way in which the subject of agronomy may be presented in actual practice. This is especially true of that portion of the course which relates to individual farm crops, to which attention will naturally be given according to their relative importance in different localities.

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[1] See also U. S. Dept. Agr., Office of Experiment Stations Circ. 39.

[2] See U. S. Dept. Agr., Office of Experiment Stations Bul. 41, p. 57, and Circ. 32.

[3] See U. S. Dept. Agr., Office of Experiment Stations Bul. 49, p. 29, and Circ. 37.

SYLLABUS OF COURSE IN AGRONOMY.

DEFINITION — Theory and practice of the production of farm crops. In agronomy we need to consider the several kinds of plants grown as farm crops under the following subjects:

THE PLANT
- Structure (anatomy).
- Composition.
- Physiology.
- Environment.

PLANT PRODUCTION — In agriculture has for its object the adaptation of environment to the anatomy and physiology of the plants under cultivation, with a view to securing crops which are best suited to the uses of man or the domestic animals.

We may conveniently begin the study of plant production by considering the general characteristics of the environment of plants as grown in the field.

ENVIRONMENT (General factors.)
- Light.
- Heat.
- Moisture.
- Air.
- Soil — Natural. / With fertilizers.

} Plant food.

But environment may be conveniently divided according to position, as follows:

ENVIRONMENT (Divided according to position.) (Chapters I-III of lecture outline, page 83.)

1. Above ground (climate).
   - Light.
   - Heat.
   - Moisture.
   - Air.

} Study the relation of each of these factors to plant growth, and also briefly their effects in different combinations, i. e., different climates.

2. Under ground (soil).
   - Heat.
   - Moisture.
   - Air.
   - Earth (soil).
   - Fertilizers.

} Point out that the relation of these factors to plant growth may be most clearly perceived by first considering them in their relation to each other.

SOIL (Chapters IV-XXXI.)
- Definition—Nature.
- Functions.
- Origin
  - Brief geological outline.
  - Weathering of rocks.
  - Accumulation of organic matter.
  - Transformation of organic matter (nitrification and denitrification, etc.).
  - Additions from atmosphere.
- Properties
  - Chemical.
  - Physical
    - Weight.
    - Color.
    - Texture.
    - Capillarity.
    - Permeability.
    - Absorptive power.

} Classification of soils, on the basis of their properties.

- Soil—Continued..... (Chapters IV-XXXI.)
  - Temperature.
  - Air.
  - Moisture...
    - Sources ..... Water table. / Hydroscopic moisture.
    - Amounts..... Rainfall. / Irrigation—Methods.
    - Drainage..... Purpose and effects. / Methods.
    - Conservation... Purpose. / Methods.
  - Tillage ....
    - Purpose and effects. Chemical. / Physical. / Biological.
    - Methods.
  - Fertilizers .
    - Definition.
    - Methods and effects of action.. Chemical. / Physical. / Biological.
    - Classification.
      1. According to constituents—
         - *a.* Nitrogenous.
         - *b.* Phosphoric.
         - *c.* Potassic.
         - *d.* Other amendments.
      2. According to form—
         - *a.* Green manures. (Farm manures.)
         - *b.* Animal manures. (Farm manures.)
         - *c.* Commercial—classify principal forms.

(Study first the general theory of fertilizers according to above scheme, and then consider, in as much detail as may be deemed desirable, different kinds of fertilizers, using Schedule A.)

Schedule A.

- Kinds of fertilizers.
  - Name.
  - Description.
  - Properties.. Chemical—composition. / Physical.
  - Place in classifications.
  - Sources.
  - Uses.
  - Preparation, care, and handling.
  - Application.
  - Effects..... Chemical. / Physical. / Biological.
  - Economy... Extent of production. / Pecuniary value.

- SOIL—Continued ..... (Chapters IV-XXXI.)
  - Waste and renovation.
    - Washing.
    - Transportation by wind and water.
    - Leaching.
    - Oxidation.
    - Cropping—rotation of crops—systems of farming.

Having considered in a general way the theory and practice of plant production as related to the structure, physiology, and environment of the plants grown as farm crops, we come next to consider the production of different kinds of crops more in detail.

- FARM CROPS ..... (Chapters XXXII-XXXIII.)
  - Classification ..... (The classification and the kinds of plants to be named under each class will vary according to circumstances.)
    - Cereals—wheat, oats.
    - Grasses—timothy, brome grass.
    - Legumes—red clover, alfalfa.
    - Tubers—potatoes.
    - Roots—mangels.
    - Sugar plants—sugar cane, sugar beets.
    - Fibers—cotton, flax, hemp.
    - Stimulants—tobacco, tea, coffee.
    - Medicinal and aromatic plants—ginseng, mint.
    - Miscellaneous—canaigre, peanuts.
  - Methods of improvement.
    - Breeding.
    - Selection.

Next study individual farm crops according to the following scheme:

- INDIVIDUAL FARM CROPS. (Chapters XXXIV-LXI.) (The crops to be studied will vary according to locality and other circumstances.)
  - Name.
  - Place in classification.
  - Structure.
  - Composition.
  - Physiology.
  - Botanical relations.
  - Varieties ...
    - Classification.
    - Improvement.
  - Geographical distribution.
  - Culture ....
    - Choice and preparation of soil.
    - Manuring.
    - Seeds (or other parts of plants used for planting)—selection—amount—treatment.
    - Planting.
    - Cultivating.
    - Place in rotation.
  - Harvesting.
  - Preservation.
  - Uses.
  - Preparation for use.
  - Obstructions to growth, preservation, or use.
    - Weeds.
    - Fungi.
    - Bacteria.
    - Insects.
    - Birds.
    - Quadrupeds.

    } Means of repression.
  - Production.
  - Marketing.
  - History.

OUTLINE FOR A COURSE OF LECTURES OR A TEXT-BOOK ON AGRONOMY.

[The lectures are intended to cover 99 hours.]

Chapter I. General Climatic Conditions
II. Plant Food and Growth.
III. Air as a Source of Plant Food.
IV. The Nature, Functions, Origin, and Wasting of Soils.
V. Properties of Soils, Chemical and Physical. Classification, Texture, Composition, and Kind of Soils.
VI. Physics of Soils as Related to Plant Growth (Capillarity, Solution, Diffusion, and Osmosis).
VII. Soil Temperature.
VIII. Relation of Air to Soil.
IX. Soil Water.
X. Irrigation.
XI. Improvement of Soil Through Drainage.
XII. Drainage Methods.
XIII. Conservation of Soil Moisture
XIV. Physical Effects of Tillage.
XV. Chemical and Biological Effects of Tillage.
XVI. Methods of Tillage.
XVII. Do.
XVIII. Fertilizers—Methods and Effects of Action.
XIX. Fertilizers—Classification by Constituents and Form.
XX. Sources and Uses of Nitrogen.
XXI. Sources and Uses of Phosphoric Acid.
XXII. Sources and Uses of Potash.
XXIII. Sources and Uses of Other Amendments.
XXIV. Practical Advice on the Use of Commercial Fertilizers.
XXV. Humus and Green Manuring.
XXVI. Animal Manures. General Statements.
XXVII. Manures Produced from Various Animals.
XXVIII. Care, Preservation, and Application of Manures.
XXIX. Waste and Renovation of Soils.
XXX. Rotation of Crops. General Statements.
XXXI. Rotation of Crops. Systems of Farming.
XXXII. Farm Crops—Classification; Production; Reasons for Choice.
XXXIII. Improvement of Farm Crops.
XXXIV. Wheat—Structure, Composition, and Varieties.
XXXV. Wheat—Culture, Harvesting, and Preservation.
XXXVI. Wheat—Obstructions to Growth, Preservation, and Use.
XXXVII. Wheat—Production, Marketing, History.
XXXVIII. Corn.
XXXIX. Do.
XL. Do.
XLI. Do.
XLII. Rice.
XLIII. Oats.
XLIV. Barley and Rye.
XLV. Grasses.
XLVI. Do.
XLVII. Clovers.
XLVIII. Pastures.
XLIX. Silage.
L. Forage Crops.
LI. Potatoes.
LII. Do.
LIII. Root Crops: Mangels, Beets, Turnips.
LIV. Sugar Plants: Sugar Beets.
LV. Sugar Plants: Cane, Sorghum, etc.
LVI. Fiber Plants: Cotton.
LVII. Do.
LVIII. Fiber Plants: Flax, Hemp, Jute, Ramie, Sisal, etc.
LIX. Stimulants: Tobacco, Tea, Coffee.
LX. Medicinal and Aromatic Plants.
LXI. Miscellaneous Plants: Buckwheat, Broom Corn, Peanuts, Hops, Canaigre, etc.

[The order of discussion of the different crops will be the same as in the case of wheat. The details to be given for each crop will vary with the importance of the crop in any region.]

PRACTICUMS OR LABORATORY WORK IN AGRONOMY.

[The practicums are intended to cover 33 laboratory periods, i. e., 66 hours.]

1. Determination of specific gravity of soils.
2. Determination of volume weight of soils.
3. The power of retaining moisture in the soil in its highest degree of looseness.
4. The power of retaining moisture in the soil when compacted.
5. Rate of percolation of water through soils.
6. Rate of percolation of air through soils.
7. Effect of mulches upon evaporation of water from soils.
8. Behavior of soils toward gases.
9. Capillary attraction in soils.
10. Determination of cohesion in soils.
11. Mechanical analysis of soils.
12. Do.
13. Study of root systems of principal crops.
14. Do.
15. Do.
16. Study of varieties of corn in field.
17. Scoring ears of corn.
18. Study of effect of fertilizers on one or more crops in fall.
19. Study of effect of fertilizers on one or more crops in early spring.
20. Study of effect of fertilizers on one or more crops near harvest.
21. Study of varieties of wheat in sheaf and by sample.
22. Do.
23. Study of varieties of wheat in field.
24. Study of varieties of oats or other grain in sheaf and by sample.
25. Study of varieties of oats or other grain in field.
26. Study of varieties of potatoes by sample.
27. Study of varieties of potatoes in field.
28. Study of varieties of grasses and forage crops in field in fall.
29. Study of varieties of grasses and forage crops in field in early spring.
30. Study of varieties of grasses and forage crops near harvest in field.
31. Study of varieties of grasses and forage crops by sample and preparation of abstracts of station experiments on climatic and soil conditions and upon quality and yield.
32. Do.
33. Do.

J. H. CONNELL.
A. C. TRUE,
T. F. HUNT,
H. T. FRENCH,
H. H. WING,
Committee.

In discussing this subject, H. P. Armsby stated that in his opinion rural economics should not be made coordinate with agronomy, zootechny, agrotechny, and rural engineering in the scheme of classification of agricultural studies, and that it would "conduce to clearness of thinking in our agricultural courses if we made our primary division into two classes; in the first place the economics of agriculture—sometimes called general agriculture, that is to say, the special economics of agriculture—and on the other hand the technics of agriculture.

"My second suggestion relates to the classification by the committee, as printed in their second report, of the technical subjects. It seems to me that if we may fairly judge from the titles and from the text-books which the committee suggests as covering in a measure at least the subjects as they conceive them, their classification is open to the criticism of being either too broad or too narrow. For instance, under the subject of 'agronomy' I find the subdivision of fertilizers, and as a text-book there is suggested Professor Roberts's most admirable book on the fertility of the land, while at the top of the page, under 'studies other than agriculture,' I find the subject of agricultural chemistry. Now, it seems to me that the subject of fertilizers belongs very distinctly to the general subject of agricultural chemistry. I mean the study of fertilizing materials and the sources of fertilizing materials as manufactured into fertilizers, and in one aspect their application."

He suggested dividing the technical agricultural studies into two broad classes—the study of general principles and the study of the application of those principles.

"The study of the principles underlying the manufacture and use of fertilizers is considered distinctly a part of the general subject of agricultural chemistry. On the other hand, when we come to consider the separate crops grown on the farm, the instructor who is charged with the duty of presenting the subject from that aspect, the applications of these principles, will use some of the same facts perhaps, but will consider them from a different standpoint—will consider them with reference to their application to the raising of particular crops or particular classes of crops.

"The subject of the nutrition of domestic animals is distinctly a part of the more general subject of agricultural chemistry; on the other hand, the teaching of the application of these principles belongs to the instructor of animal industry. It is his business to take these general principles which are taught by the instructor of agricultural chemistry and show how they might be applied in practice to the breeding and feeding and handling of different classes of stock."

Mr. Armsby moved that the report be accepted as a report of progress and the committee continued.

Carried.

It was the general opinion that the matter had now reached a stage which demanded discussion by the convention. In conformity with this idea, E. A. Bryan, of Washington, moved "that the executive committee be requested to take into consideration the desirability and propriety of setting apart a stated period in the programme of the next annual convention in which the reports of the committee on methods of teaching agriculture may be considered in general session."

The motion was agreed to.

C. C. Georgeson spoke briefly of the progress made by the Department of Agriculture in studying the agricultural possibilities of Alaska, specimens of crops, including flax, oats, clover, timothy, etc., grown in the region of Sitka during the past year being exhibited.

A. C. True explained briefly the plan and purpose of the Department's investigations in Alaska.

The Chairman. One item of business is left to be disposed of. The National Pure Food and Drug Congress is to hold its annual meeting in this city January 18 to 21, 1899. As the chair learns from our secretary, this Association is entitled to five delegates and five alternates to represent it in that congress, at their own expense.

M. A. Scovell. I move that the matter be referred to the executive committee, with power to appoint delegates if they see proper to do so.

Carried.

Mr. Armsby. There is one item of business from the Section on Agriculture and Chemistry which it seems necessary to bring up now, inasmuch as I understand there is to be no evening session. The report on uniformity in station nomenclature was referred to that section, was there considered, and with certain verbal amendments was recommended to the Association for adoption. The chairman and secretary of the section being both absent, there is no way to bring the matter forward except in this unofficial way. If the convention is willing to take any action on the subject, it might now be disposed of.

On motion, the Association confirmed the action of the Section on Agriculture and Chemistry. (For report on nomenclature see p. 117.)

The convention then, on motion, adjourned sine die.

MINUTES OF THE SECTIONS.

SECTION ON COLLEGE WORK.

The Section on College Work met in the main parlor of the Ebbitt House, November 15 at 4 p. m., and was called to order by Alston Ellis, of Colorado.

E. A. Bryan, of Washington, read the following paper on "Some recent changes in the theory of higher education."

Some Recent Changes in the Theory of Higher Education.

Educational processes precede rather than follow the theories upon which they are based. The rational explanation comes later to modify, strengthen, or defend the existing process. That there have been many and great changes in the means and methods of higher education in modern times is evident from the most cursory comparison of the catalogue of a modern college with the college catalogue of even half a century ago. A glance at the books now accessible to the student, or a glimpse into the modern laboratories would confirm this conclusion. That these outer changes are the result of a change in the theory upon which we proceed, would be more than suspected by the careful observer. The theory upon which we are proceeding has not perhaps as yet received an adequate statement, and we are still repeating the explanation of our educational practices of half a century ago. To-day we confront new purposes, new ends, and new instrumentalities, all of which point to a revolution already effected. This change in theory and practice is due, in part at least, to a difference in the objects in view in higher education; for, as an economic law, the nature of education will be determined by the use to which it is to be put. As a matter of history it has been so determined, whether the object has been the practice of literature, of statecraft, or law, or medicine, or engineering, or priestcraft, or dilettanteism. In the founding of the first colleges in America the object in view was an educated ministry, and a collegiate course was largely made to subserve the ends of a professional training. The same object determined in a measure the curriculum and methods of earlier European university education. When later to this primary theological aim of collegiate education was added the somewhat broader purpose of preparation for the so-called "learned professions," it was inevitable that there should be a modification of the means employed. Another step was taken when it became a recognized object of the college to educate the gentleman of leisure and the "man of letters." But when the notion that a college education had other uses than that of providing a supply of preachers, lawyers, doctors, and gentlemen scholars; when the broader conception of the efficiency of higher education in fitting men for service in the affairs of the political, commercial, and industrial world became apparent; when men came to see that there is no sphere of human activity in which the trained mind does not find large opportunity, it was inevitable that these changes should be reflected in the college curriculum.

A few simple illustrations from the oldest and most illustrious of American colleges, Harvard, may serve to render more vivid the course of development which I have indicated.

The requirement for admission to Harvard about 1750 was "to be able extempore to read, construe, and parse Tully, Virgil, or such like classical Latin authors, and to write Latin in prose and verse, or at least in the rules of Prosodia, and to read, construe, and parse ordinary Greek, as in the new Testament, Isocrates, or such like, and decline the paradigms of Greek verbs, having withal good testimony as to his past blameless behaviors.

"The undergraduates shall be brought forward by their respective tutors in the knowledge of the three learned languages, viz, Latin, Greek, and Hebrew, and also in the knowledge of rhetorick, logick, natural philosophy, geography, ethicks, divinity, metaphysics, and in the elements of the mathematicks.

"The undergraduates shall in their course declaim in the hall in one of the three learned languages, and in no other without the leave of the president.

"The senior sophisters shall dispute publicly in the halls once a week until the tenth of March, the junior sophisters in like manner twice a week during that term and once a week afterwards."

The text-books used included, besides Latin and Greek texts, Gordon's Geographical Grammar, Gravesend's Philosophy, Euclid, Wollebein's Compend of Theology (in Latin), Brattle's Compend of Logic (in Latin), Watt's Logic, and Locke on the Human Understanding.

In 1803 admission requirements included besides Latin and Greek, geography and arithmetic to the Rule of Three. By 1825 the requirement in mathematics had been increased and made more specific. The applicant must be well versed in "the fundamental rules of arithmetic, vulgar and decimal fractions, proportion, simple and compound, single and double fellowship, alligation, medial and alternate, and algebra to the end of simple equations."

The curriculum of the same date is still mainly made up of the "three learned languages," but has more mathematics and a little physics and chemistry

By 1850 a little geometry had begun to be required for admission. The requirements for that period wind up with the statement that "it is very important that the candidate should be thoroughly prepared, particularly in grammatical, material, and elementary knowledge." The curriculum of the same date includes more mathematics, more physics, more chemistry, finds a place for natural history, the modern languages, history and political economy, etc., and provides that "the Hebrew language may be taught to those who desire to learn it." Thus far and much farther a definite and prescribed course.

Turning now to a modern Harvard catalogue, I count 479 distinct courses, exclusive of those of the summer school, given under the auspices of the faculty of arts and sciences alone, any and all of which may be chosen under moderate restrictions, and from any of which may be extracted the "culture" and "discipline" which is the patrimony of the liberally educated, whether the course selected be old or middle Irish, the principles of delineation, color and chiaroscuro, counterpoint, the theory of curves, the theory of probability, phylogenesis studied as a process, or anthropometry, with practical illustrations by Professor Sergeant.

A perusal of the entrance requirements reveals changes commensurate with those in the curriculum. Modern as well as ancient languages, history, greater mathematical ability, an elementary knowledge of some of the sciences and of the scientific method are now required.

A revolution has thus taken place. The Latin, Greek, and Hebrew are no longer renowned as "the three learned languages," the sole source of polite learning and higher education. A hundred new rivals for a place in the curriculum have sprung up and have made good their claim. The narrowest of curriculums has given place to the broadest. The largest academic freedom has taken the place of a strait-jacket system. Things as well as words are considered fit instruments of education. The candidate for a scientific education is no longer a taster of all the sciences, but rather drinks deeply of one. A so-called "general" education is suspected of being no education. We hear less of "disciplinary" values as being inherent in certain objects of study, and we rely more upon the method by which the mind does any piece of work. We have come to conceive of education not so much as a state or condition attained as the increased and increasing efficiency of the active subject.

The revolution in curriculum and method is the necessary outgrowth of the change in the purposes and in the rational explanation of higher education.

If we were to go back no further than twenty-five years in the history of the average American college we would find that it required more than the ordinary courage for a young man entering college to select any but the time-honored "classical" courses in which nearly one-half of the curriculum, and much more than one-half of the curriculum as measured by the time devoted to preparation, was given to Latin and Greek. The one who ventured to study German and French was looked at askance by faculty, alumni, and students. The selection of the so-called "scientific course," or any other of the courses then beginning to be offered, was a confession of weakness. Those were the days when such an anomaly as a "professor of science" was common in the college faculty. But this conception of higher education which yet lingered was one which for many centuries had been accepted. The statutes of St. Paul's School in 1518 required that the master be "lerned in good clene Latin literature, and also in Greke, if such may be gotten." A statute of 1496 required that gentlemen's sons be sent to school in order to learn Latin, that being accepted as the means to polite learning. Hallam, in speaking of the progress of learning in the sixteenth century, when books were scarce and the learning of the day was transmitted by lectures copied by the student, a work of infinite labor, says: "The labor of acquiring knowledge strengthened, as it always does, the memory; it excited an industry which surmounted every obstacle, and yielded to

no fatigue; and we may thus account for that copiousness of verbal learning which sometimes astouishes us in the scholars of the sixteenth century, and in which they seem to surpass the more exact philologers of later ages." "Verbal learning" is a happy phrase by which to characterize both the means and ends of higher education for centuries.

Scholasticism had relied upon the civil and canon law and upon an artificial system of ratiocination as its curriculum. It had bitterly opposed the revival of literature, and at Oxford, the University of Paris, and in Germany resisted, even to mob violence, the introduction of Greek. Yet the system of education which followed was closely allied in character and purpose to scholasticism. Linguistics constituted the chief element of the curriculum of all the schools from the revival of learning onward. Astronomy, alchemy, medicine, and anatomy were studied, but only by a scholar here and there. That the Latin and Greek languages and literatures should have become the instrument and end of higher education in that passionate outburst of the human intellect which we characterize as the "revival of learning" is not to be wondered at, since these literatures embodied not only the best thought of mankind, but also its accumulated stock of knowledge.

To add to this it may be said, as it has been said, that in the very nature of things language study must always be one of the most important means of education. Language is but the reflection of thought. The relations between thought and speech are vital and essential. Language serves not only to store up the accumulated thought and knowledge of successive generations of men, but is the shortest and best means of obtaining these. In an age when the accumulated wisdom and knowledge of the world were stored away in the two great classic languages, in an age when the authority of the sage and the savant were more trusted than the evidence of our own senses, in an age when men had not learned to question nature and extort her secrets, the natural and necessary course of education was the study of the classic languages and literatures. The internal structure of colleges and universities having been formed under such conditions, it followed that the structure would give place to reconstruction slowly, if at all.

A theory or rational explanation of a system, as has been said, usually does not precede but follows the operation of the system itself. And so the theory of the peculiar adaptability of the study of language and literature to mind culture by virtue of their close relation to thought, the theory of disciplinary value of a certain two of these languages came to explain and support the system long after the conditions under which it arose had ceased to exist. Then, too, these studies had assumed, in the course of time, what William T. Harris would call "a pedagogical form," a matter of great importance. But when a learned ministry was no longer the exclusive object of higher education the pressure within and without for a broader curriculum led to the introduction of many subjects. The supreme "disciplinary" value of the classics was still insisted upon, and these continued to form the principal part of the curriculum. The educated gentleman rather than the preacher, lawyer, or doctor now became the theoretical end of college training. Such an one should have a wide survey of extant knowledge. To this end he reads elementary texts and listens to lectures for a term or two on each of a dozen or more physical or metaphysical sciences. He obtains a "reading knowledge," a bird's-eye view, a sort of general comprehension of what all these sundry sciences are about, which, with the so-called "severe" course in the classics and the mathematics, were supposed to advance him to that state or condition known as "culture." Even this broadening of the curriculum is constantly discredited as having for its end an increase in the number of students. Scientific courses are condemned as "utilitarian," which is interpreted to mean mercenary. The only worthy aim in education is assumed to be "culture," and this springs from changes within, which can come only from the severe discipline of classical studies.

Now, I take it that this theory of higher education was valid during certain periods and is valid to-day within certain limits. With the growth of human knowledge and a more adequate philosophy of education, it came to be believed that not only was it dignified for an educated man to have a knowledge of these subjects which relate to the universe about him, but that these subjects might be used as a means of education. And so the mathematics, the natural and physical sciences, and politico-historical subjects became college and university studies. Blindly elementary and higher education alike were groping toward this higher conception of fitting man for living, moving, and having his being in this his environment by training his mind and body through the instrumentality of the very things composing this environment. Slowly the notion was forming that the mind grows by what it feeds upon, and that it feeds upon the multitude of sensations which come flocking inward through the open windows of all the senses; that the blue-bird's wing and the silver sheen of the speckled trout meet with a corresponding somewhat in the human mind just as surely as does an epigram of Plato; that truth and beauty lie no more deeply concealed in every dull clod and crawling worm of this great cosmos about us than

in the mysteries of this microcosm within us. And so it has come to be accepted that the mind may grow on chemistry as well as on philosophy; that it may expand under the influence of science as perfectly as under the influence of poetry; that sociology is a not less comprehensive and useful instrument of higher education than mythology.

But another thought has been struggling for recognition in the realms of higher education. And this may perhaps be best expressed by saying that the mental and material welfare of man can not be separated. So long as that higher, larger life of the liberally educated is confined to a small class and that small class comes in the nature of the case from a class possessed of wealth, or by the monopolistic character of its powers may readily provide itself with wealth, the consideration of this close relation of spiritual and material welfare may remain in abeyance; but so soon as there is an attempt to lift the masses of mankind into the broader, higher life, or so soon as under the influence of universal elementary education society begins to push itself up into these realms, then the question of the corresponding advancement of the material welfare becomes of paramount importance. It is only recently that the study of the economic history and development of the race has been thought worth while. It was enough to write and read of the rise and fall of dynasties, the selfish ambition of kings, devastating wars in the name of ambition or religion, the fight for sacred principles, and the natural rights of man. But even the brief glance at the history of the material progress of the race which has thus far been made has revealed the fact that these fights for sacred principles and the eternal rights of man have ever taken place near the base of supplies; that our sacred revolutions have had as their most sacred features a question of bread and butter; that our attainment of liberties has been the attainment of liberty to enjoy the fruits of our own toil; that our emancipations have been emancipations from the conditions which nature imposed or from the masters who appropriated the fruits of our toil to their own material support; that the growth in the intelligence, morality, and spiritual welfare of any community has been synonymous with the growth of the community in wealth, even if the latter has not been caused by the former. It follows that this close relation between mind growth and material welfare must affect the theory and practice of higher education as well as elementary. This conception of education looks to the close touch of the educated man with all the interests of human life, not merely with the spiritual or æsthetic. It would arm and equip him to lead mankind in its struggle with the material universe. It would not fit him for a holiness class which is rendered unclean by contact with material concerns. It would bring the trained mind, the knowledge, and the methods of the educated man to the solution of the problems of war, commerce, agriculture, manufacture, public health, government.

If it is true that these common things which go to make up our environment may be used as the subject-matter for higher education, it is also true that in the selection of those which may be used and in the method by which they are studied an economic end may be subserved. The mind may attain to as true and high a culture, as great a power, as comprehensive a grasp through the instrumentality of these subjects which are closely related to common welfare as through those which have little or no relation to it. Certain subjects because they have an economic bearing and because they have contributed to greater efficiency in their industrial application, are not thereby disqualified as means of higher education. Even yet leaders of the public mind look with suspicion upon the use of any subject in the curriculum if it has plainly a utilitarian bearing. "Truth for truth's sake" is wisely the cry of some scientists. But there is no need that they should decry the seeking of useful truth. That the use of such a curriculum in proper proportion will bring the man educated under such a régime into closer sympathy with the great producing multitude of mankind can not be denied. It must happen, too, that the chances of his contributing to the advancement of human industry are vastly increased by such an education. All will admit that modern science has contributed greatly to the amelioration of the race. Here have been its greatest triumphs. That scientists should deliberately set before themselves the task that they should bring their vast resources of knowledge and their use of the scientific method to their aid commands our admiration and approval. Why should the leaders of educational thought look askance if, in the process of education, the material used should have this same economic end in view? Why should not the investigation of the fungi be deemed as high and valuable a means of education as the learning of the nomenclature and habits of all the flowering plants that deck the mountain side? This addition to the theory of higher education, which is no less education because of its utilitarian characteristics, is even to-day struggling for recognition.

The effect of all these changes which I have enumerated has been to extend the theory of higher education formerly accepted, not to overthrow it. All that was once true in the theory is now true in the theory. The ministry of linguistic studies continues to be great and to operate as it ever did. The study of mental and moral philosophy is as important and worthy means of education as it was in the days of

Locke. But the vast extension of human knowledge through the development of what we popularly call "the sciences," the emergence of many great modern languages which are the common heirs of the world's knowledge and through which investigators have been eagerly exploring the unknown realms of nature, the uprising of the mighty people toward higher and better mental, moral, and physical conditions, constitute a set of new conditions which vastly extend the former theory and completely revolutionize the methods of higher education. The revolution was long deferred. So swift and so complete was it that the men of a generation ago, going back now, wander through the old college halls and find few familiar traces, except the old bricks and mortar and now and then a dog-eared Latin dictionary to remind them of the days that are gone. The revolution was not without premonitory signals. Rumblings of discontent were to be heard even from those who had attained to their power through practice in the old curriculum. Scoffings were heard from those strong, nervous men who rise to power, fed on other meat than that furnished by the schools.

A restless public sentiment proclaimed the fact that friction was developed in the operation of the system. Spasmodic efforts to reform the courses of study now and then appeared. In 1825 Harvard College adopted a resolution that "the university is open to persons who are not candidates for a degree and desire to study in particular departments only." This attempt to meet the changed conditions with a changed curriculum was unsuccessful. In 1841 an elective system was proposed. It enforced a prescribed curriculum to the end of the freshman year. It then allowed the discontinuance of Greek and Latin, with the choice of a substitute in one or more of the following branches: "Natural history (this so late as 1841, remember), civil history, chemistry, geography and the use of globes, popular astronomy, modern languages, modern oriental literature, or studies in Greek and Latin which may not have been discontinued in addition to the prescribed course in such branches."

A criticism of the day, appearing in the North American Review, reveals the theory then generally received as to what higher education is. The critic, after predicting the failure of the plan after one or two years' trial, expressed the hope that then "they will be willing to retrace their steps and to stake the reputation of Harvard College not on the number enrolled (which he assumes to have been the motive of the change), but on the extent, accuracy, and thoroughness of the education obtained within its walls.

The elective system of 1841 was a failure, and it remained to the administration of President Eliot and the end of the century to make it a triumphant success. In 1827 a member of the corporation of Yale College introduced a resolution that a committee be appointed "to inquire into the expediency of so altering the regular course of instruction in this college as to leave out of said course the study of the dead languages, substituting other studies therefor," all of which goes to show that the spirit of progress had penetrated even that stronghold of conservatism.

In 1826 Amherst provided for the addition "to the present classical and scientific four years' course" of "a new course equally thorough and elevated with this, but distinguished from it by a more modern and national aspect, and by a better adaptation to the tasks and future pursuits of a large class of young men who aspire to the advantages of a liberal education." It provided "a department devoted to the science and art of teaching, but more especially at first to the education of schoolmasters." It provided also, mirabile dictu, for a "department of theoretical and practical mechanism."

But these changes were but the faint gleams indicating the approach of a coming day. No one thing hastened the approach of that day so much as the development of the sciences and the application of the scientific method. Science, after all, is very simple. It is not a mystery, not a word to juggle with. The object of scientific investigation may be the commonest, the most humble thing. The scientific method is likewise simple. It is the application of plain common sense to the acquirement of accurate knowledge. The method is the same, whether applied to the investigation of the structure of a cow's teat or the characteristics of the X-rays. But the substitution of these subjects for linguistic and philosophic subjects effected a complete revolution in our colleges and universities. Simple as are the subjects and the method, they involved a vast increase in the appliances of the colleges and in the number of the faculty of instruction. Under the old régime, when the necessary equipment consisted of Latin and Greek grammar, or dictionaries, and texts and copies of Euclid, and when large classes could gather on one or two recitation benches to recite to one man, it was possible for a college of some pretension to be conducted in one bare building with a faculty consisting of a few scholarly men. But when individual investigation, the acquirement of knowledge at first hand, became necessary, not only must extensive laboratories be built and equipped with all the necessary paraphernalia, but fewer men could be cared for by one instructor, and this one must have carried his own investigations far enough to be a competent guide to the others.

But the same scientific method quickly extended itself to other fields than those of nature study, and the research method came to characterize the study of history and economics and politics and sociology. Even the science which had relied upon introspection caught the infection, and experimental psychology is to-day a fact, not a fad or a fancy. The development and differentiation of the new subjects and the possibilities opened up to men educated along the several lines forced the enlargement of the curriculum and the acceptance of the elective system. Forthwith upsprang new buildings, laboratories and laboratory paraphernalia multiplied, libraries extended themselves and took on a new character, faculties doubled and quadrupled in numbers, and young men with a foreign air, who prided themselves upon being called "specialists," were dubbed professors or doctors, while gray-headed men wearing faded coats and classic brows wandered vacantly about the college halls where erstwhile their very footfalls struck a thrill of terror into the heart of the luckless student who chanced to cross their path. The theologian, a very Goliath, armed with a spear of logic like a weaver's beam, rose to meet the young David, science, clad in kirtle and bearing a simple sling. But simple truth must prevail. It has prevailed. The world has scarcely witnessed a greater revolution than the silent one in higher education which has taken place during the last half of the present century. It is still taking place.

The doctrine of the "disciplinary" value of certain privileged subjects; the doctrine of the "culture" ends of education; the attempt to array "culture" and "utilitarian" educational values against each other as antagonistic and mutually exclusive, show that the end is not yet.

"Discipline," if it means anything, means that the mind has become subjected to self-control; that it may be directed into a given channel and kept there; that its efforts may be regular and not spasmodic—methodical, not discursive. Discipline is an incident of mental activity along any line and is the result of the continued effort to direct the mind along certain channels steadily and methodically. It may spring from any well-ordered curriculum, whether the Greek race course or the course of a mediæval or modern college.

Culture as an end is an ignis fatuus. Culture is an incident of our thinking and doing along the line of our powers, of our normal development. Correct, systematic, and continuous thinking along the lines of the orderly development of the Greek and Latin languages and the study of the literatures of those two brilliant races have given to the minds of many men a discipline and power which may well entitle them to be described as "cultured." But consecutive and systematic thinking along any line would, in so far, have produced a like efficiency. Culture is but the condition accompanying a large, informed, and proper activity of the mind, just as happiness is the reflex of unimpeded energy; sought after as a sort of ecstatic state to which the educated may attain, it is as vain a hope as was holiness to the mediæval ascetic. With culture as an end, educational systems have no business. Society in education, elementary or higher, can only have in view the making of more efficient members of society. It can not consider education apart from its use.

Utility, like discipline and culture, is an incident of intellectual activity. The knowledge, power, and efficiency which accompany this activity incidentally fit men for dealing with their environment; and their efficiency will be greatest along the direct line of their intellectual training. Psychologists are even now debating whether general intellectual power is the result of specific intellectual activity, and whether, after all, efficiency does not lie within the narrow limits of the things we have learned. However that may be, utility is a result, in greater or less degree, of all education. There has grown up a habit of setting off "culture" ends and "utilitarian" ends in education as opposed and of unlike kinds. The separation of culture and utilitarian ends is impossible either in theory or methods. The education of highest culture value should give efficiency in the production of utilities, whether those utilities be discovered in works of art or literature or commerce or social well-being. Efficiency, after all, is the end society aims at in education. To add correctly, to speak grammatically, to write a well-rounded period, to distinguish between the gerund and the gerundive—that is not culture. But the discipline and power and efficiency which spring from training in a curriculum wisely chosen constitute a culture which can not be made ignoble either by the subject-matter of the studies or by the sphere in which they are employed.

As we have come to recognize the value of other subjects of study than those connected with language and metaphysics, as we have come to substitute for authority the answers which nature and reason give to our questions, as we have come to employ rational methods of investigation, so will we soon come to know that there is no divorce between the mind of greatest power and culture and the employments which administer to ordinary human want.

It was the movement of human thought along these lines that led to the revolution in college curricula and methods which has marked the last quarter of this century. There has been no more striking illustration of this movement than the series of legislative acts in America beginning with the Morrill act of 1862 and the educa-

tional system springing out of these. I think I speak truth when I say that neither the great public nor the educators are couscious of the full meaning and force of the movement. Unfortunately even those into whose hands the fonuding of the new institutions has fallen are not as yet fully agreed as to the scope and character of the undertaking. Unfortunately again, for the public understanding, a considerable part of the best work that has been done by these institutions has been hidden under the name of the universities of which these institutions have formed a part.

Unfortunately, still again, some of the separate institutions have proceeded on so low and inadequate a conception as to mislead the public or to bring discredit upon the system. The main purpose of this type of institutions is higher education. It is also the conscious purpose of the movement to bring the best that education has to offer, the best that science has to offer, and the best that educated men have to offer to the betterment of human industry and the welfare of the masses of the people. No more fatal mistake could be made than to proceed upon the theory that the secondary end aimed at—viz, the intellectual and material welfare of the industrial classes—is to be gained by making the education thus offered only elementary or to consist only of manual training. Some, reversing the true order, assume that the primary object of these institutions is to make a farmer or a mechanic, and conclude that he must be kept ignorant enough so that he will be compelled to farm or work at a trade. There is a mortal dread of teaching him too much lest he may not do that which you have predestined that he shall do. If such were the aims, then would the colleges of agriculture and mechanic arts be a fatal mistake, for they could never accomplish the ends thus proposed. But it is possible to gain an education of the highest type through a curriculum which includes those subjects with which human industry has to do; it is possible to gain a higher efficiency in dealing with these industrial pursuits from such a curriculum than from one entirely foreign to them; it is possible for the scientist to consciously set before himself the economic problems to be solved and to use his great knowledge, skill, methods, and appliances in their solution. It is as possible to endow and equip members of society to be the captains of industry as of war. In an industrial age it is as much a function of education to produce the man efficient in directing industry as it once was to produce one capable of directing the spiritual life or protecting the legal rights of the people.

But this high purpose of education can only be accomplished if curriculum, instruction, and equipment are of the highest type and correspond to the highest intellectual efficiency. Human industry deserves the best that science, the best that human intelligence, has to offer. It is our business to educate, not to fill up certain trades or callings with operatives. What people do and become is determined by economic considerations. If they are to be useful, if through their instrumentality science throws new light on industry, lightens the burdens of humanity, substitutes the machine and chemical reaction and hygienic law for muscle and blood and disease, then the new realms opened up must be fully explored. And the highest skill must be attained. Fourteen weeks in botany, fourteen weeks in chemistry, a little zoology, a little entomology, a little physics, and a great deal of doing what the student already knows best how to do are of little avail. The results are a confused mass of names without concepts, a pretender with an exalted opinion of his knowledge because he knows the big words, an ignorant man in the community who poses as an educated one. The result of so low an ideal of the function of the colleges of agriculture and mechanic arts, were it to prevail, and it will not, would be as dismal a failure as that of the so-called "business colleges," whose function, at best, has degenerated into a more or less adequate training of clerks and office subordinates.

This broader conception of higher education which not only employs new curricula and methods, but consciously sets before itself new purposes, is working its way into the minds and hearts of our people. Looking at the college of to-day it appears that some modification in the statement of the theory of higher education would be necessary. Such a new statement I shall not attempt to make. I might, however, be permitted to summarize some of the changes—a summary which is intended to be suggestive rather than complete—by the presentation of the following theses:

(1) Discipline, power, efficiency, culture, so far as higher education is concerned, are not the exclusive results of any single study or curriculum.

(2) Any subject which stands for the laws of mind or matter may be made the instrument of mind growth.

(3) A subject is not disqualified for the curriculum because it may have an economic bearing.

(4) Academic freedom is conducive to better average results in higher education.

(5) The curriculum of elementary education should include language, mathematics, nature and sociological studies, not only as essential to a proper mental development, but as the key to higher education, and the curriculum of higher education should include the same types.

(6) It is not essential to higher education that the whole field of human knowledge be covered even in an elementary way.

(7) Adequate investigation of one or a few subjects, with acquirement of the scientific method and the power of independent investigation, is better than superficial study of many subjects.

(8) The natural and physical sciences are entitled to an equal place with linguistics in the curriculum.

(9) The so-called "laboratory method" should supersede subservience to authority.

(10) No subject of the curriculum is to be regarded as an end in itself, but as instrumental to higher aims.

(11) The separation of "culture" and "utilitarian" ends in education is impossible.

(12) The purposes of higher education include the application of its results to industry and to the material welfare of mankind.

R. W. Silvester spoke as follows:

In the address we have just heard the salient points in the new education have been masterly dealt with. The origin of the old education arose, as was justly remarked, from a most apparent, necessary condition at that time. Our present status is a product of the law of evolution as certainly as is our perfected animal or vegetable product or the type of our existing manhood or womanhood. The irrepressible conflict still goes on. As we stand here this evening, critics upon the past, we must realize that our critics are still to come, to whom our methods will appear as crude and as discordant to the real harmonies of the great universe as do those of our predecessors to us. This, however, should not act as a deterrent to us in the thought building of our day and generation. With the light which we have we stand upon the unassailable position of the great law of the brotherhood of man. No privileged class, no thought that certain forms of labor dignify man, but rather man, with his trained head, trained hand, and trained heart, dignifies any form of human effort to which he may devote his energies. This is the truth which has been dawning upon the vanguard of human progress for years. The acceptance of this is the foundation of every change in the theory of higher education.

I say "theory" with regret, for all theory has as its basis hypothesis to account for phenomena. It is time that we had facts for data on which to base the indisputable scientific law for education in departments of human activity.

It is not for us to minimize the value of the old curriculum. We all acknowledge that it had and has its use. It was the natural outcome of introspection. Its training value was apparent in its special field; it was the opposite swing of the pendulum to its present position. Our attitude should be to conserve from the great storehouse of the past all the truth that it contained and incorporate it in the implements which we, in our day, are forging for use in the attack upon the future difficulties of our great work.

President Eliot, Harvard's greatest president, has done more to give us the true scope of higher education than any educator of modern times. The introduction of the elective system in the undergraduate courses was the first breach in the apparently impregnable wall of mediæval scholasticism. This was the forerunner of many changes since. To train leaders, men who have originating power, who reach forward, and in all fields of activity push beyond the beaten paths of habit, tradition, and custom, is his definition of a university; not in one line of work, not alone with himself by introspective thought to evolve a system of metaphysics and a code of morals, but rather the exercise of the other faculties of his being, to be able to look outward and upward and collect data upon which to predicate the existence of laws whose recognition and mandates obeyed would lead to the uplifting of the human race.

To us, engaged in our special work, here our province lies. The field is wide; a people engaged in producing the wealth of a country, constituting the bone and sinew of our great nation, giving us the product to more than settle the balance against us on the ledgers of nations, bound to the beaten paths of habit, tradition, or custom.

Here is the opportunity to engage the wisdom of the wisest and the energies of the most stalwart. Are we accepting these responsibilities? Are we making the changes so necessary in order to deal intelligently with these immense problems?

The basis of my affirmative answer is found in the classic of its kind, written by our associate, Dr. Charles W. Dabney, of the University of Tennessee. In his address, "The old college and the new," the comparisons are strongly drawn, not invidiously. Due credit is given to the old curriculum; its merits are enumerated. The indictment is, being a one-sided system, it must make a one-sided product. No flaw can be found in the count. The foundation of the new education is announced in the following language, so apt, so replete with wisdom that I may be pardoned its quotation here.

"The harmonious and equitable evolution of man does not mean that every man must be educated just like his fellow. The harmony is in each individual. That

community is most highly educated in which each individual has attained the maximum of his possibilities in the direction of his peculiar talents and opportunities." This is the basis of our present work; no longer an ironbound curriculum admitting of no variation, but the whole realm of nature, with its diversified departments, each of dignity and importance sufficient to engage the whole of man's intellectual power. The microscope, the test tube, the telescope, the galvanometer, are no longer the magician's wand in the hands of an erudite professor; rather, household words to the student himself. He learns to do by doing; he interrogates nature and translates her replies for himself. His instructor is not the tank from which he draws his daily supply. Educational methods are assuming their proper rôle. The student is impressed with the fact that intellectual no less than physical strength comes from action, and that atrophy in the intellectual organism follows inaction as certainly as it does in the physical organism of man. The professor's function is to outline and develop in the pupil progress, with the minimum amount of help. The successful teacher has little to say. He is a good listener; thus encouraging thought and expression on the part of the student.

These characteristics are all the product of the change in the method of education. With this before us, with our responsibilities upon us, what are we doing to show that we not only realize the failure of past educational methods to reach every brother man and convince him of the fact that, no matter what may be his vocation, in it he can find harmony and pleasure if he has so trained his mind as to make logical, keen, incisive thought a principle in directing the affairs of his business? Yes; each man for himself can

> Find tongues in trees, books in the running brooks,
> Sermons in stones, and good in everything.

This is particularly true of our division of educational reform and work. What are some of the agencies which we are using to accomplish this purpose? The university extension idea, in its many shapes and forms, is doing great work from our agricultural colleges and experiment stations as centers. We see tendencies everywhere to indicate that the seeds of thought are well sown and well nurtured in the ripening harvest all around. The process is slow; must be.

Any man with experience as an instructor, whether it be with those of mature years or with the adolescent, knows how difficult it is to deal with a being or a community wedded to a tradition, a custom, a habit, or a prejudice. I appeal to you as educators to know if, in your experience, you have not found it more difficult to develop correct methods of thought in a man wedded to an idea, who really possesses some power to think accurately along lines pertaining to his hobby (if unassociated or incomparative thought is ever accurate in its broadest sense)—I say, have you not found it more difficult to develop correct methods of thought in such a one than you have in one who has no knowledge of its processes, untrained in the art, simply a tyro in that which constitutes the grandeur of manhood. Now, what man among you has not found this condition in dealing with those for whom our agricultural colleges were called into existence? Our methods have been modified to meet these exigencies. The oneness of all nature, the grandeur of the whole, the correlation of all of its parts, the interdependence of one upon the other, and the appreciation of the fact that in all the realm of nature not one discordant note is found, save as man modifies the operation of law in the great symphony of the universe—I say that we have found that this can only be taught by directing attention to the individual law, and from this leading up to collective law. In weaning people from traditional methods the most potent means that can be employed is the narrow, concrete path of self-interest. Prof. Voorhees, in a lecture before the Association some time since, called attention to this fact, in the matter of proper fertilization of sweet potatoes. When his advice materialized in dollars and cents his scientific information was not odious.

The laws of nutrition for plants or animals, soil conditions favorable to crop productions, bacterial ferments in the curing of crops, crop conditions as modified by methods of cultivation, and every other law in the science of agriculture must for the present take this concrete shape. It is our duty, however, to introduce as rapidly as possible every means which tends to a broad toleration, a recognition of the worth of each department of our congruous whole. How often have we seen the narrow, incomplete products of our handiwork in our faculties; in men decrying the usefulness of other departments save their own; in the schedules insisting upon time out of proportion for the reason that this department or that department is not so important in the general make-up of the product out of the raw material in hand. In ordering our changes, in developing our products, this is a Charybdis we must avoid. A truly trained man is one devoid of such narrow feelings. He does not feel that the foundation of his profession is to be erected upon the ruins which aspersion and intolerance make of any one of the sister sciences. His knowledge of nature and her laws tunes his inner ear to appreciate the fact that the grandest symphony which can ever come to a listening world is that one which issues from an orchestra in which every law of nature takes its part.

This is the one fear I have in the crusade we have commenced—that we will carry the simply practical too far. We must train men who love truth for its own sake; who are as enthusiastic over a principle whether the sheen of the dollar gilds it or not. To such men the world owes its progress. The practical throughout the world, in every department of human activity, is simply a stream flowing from a spring which may truly be called theory. Without the latter the former can not exist.

And now let the crowning act in all our efforts be the establishment here in our national capital of a great national university which shall be a fitting capstone to the structure we are erecting—a university so broad in its foundation, so generous in its scope that every law of God to man may find for its votaries a congenial home in which to seek a full recognition of its import and impart the same to our common country, to-day easily the first in the world in appreciating the true principle of good government, the first to write the rough draft of the great law of the brotherhood of man, and which we will yet perfect and live by; in the language of another, the first to offer to its citizens such a liberal education as may be said of the man possessing it, "his body has been so trained in its youth that it is the ready servant of his will and does with ease and pleasure all that as a mechanism it is capable of; whose intellect is a clear, cold, logical engine, with all of its parts of equal strength and in smooth running order, nearly like a steam engine, to be turned to any kind of work, and to spin the gossamers as well as forge the anchors of the mind; whose mind is stored with a knowledge of the great fundamental truths of nature and of the laws of her operations; one who, no stunted ascetic, is full of life and fire, but whose passions have been trained to come to heel by a vigorous will, the servant of a tender conscience; one who has learned to love all beauty, whether of nature or of art, to hate all vileness, and to esteem others as himself."

In this we find the teachings of the lowly Nazarene, and may He give us the power to so train those who are under our guidance. With this power, and fully exercised, the educator will have passed from the field of experiment, and his methods will be characterized by the truly scientific spirit.

The basis of our university is now with us; every department is represented, and it only needs a strong hand to weld them into a comprehensiveness which will make them a congruous whole.

Can not the power of this Association do this work? I believe that it will.

The changes in the higher education of women are, perhaps, more marked than in any other department of educational work. This good work here commenced should be encouraged and supported by every true lover of his race. It has been wisely said that respect for woman is the shibboleth of the Anglo-Saxon race and the palladium of its manhood. Respect is necessary, but this is not all. Opportunity is equally important. The system of education offered to woman up to within the past few years has been an outrage to her capacities. A sex less strong, less filled with inherent worth, would have been dwarfed into a condition which would have been pitiable in the extreme. She has survived her vassalage in this particular, with her powers dwarfed, yet still capable of filling her sphere, with her increased opportunities, in a way commensurate with its obligations. Universities are now opening their doors for her entrance, and she is entering upon a training to fit herself for the great responsibilities entailed upon her by virtue of her being the priestess of the home and the mother of the human race.

Our agricultural colleges are doing a great work along these lines. The rural home needs a well-trained wife and mother for the uplifting of the standard of American manhood and womanhood, weakened and enervated by the devitalizing and demoralizing tendencies of the average urban home under past conditions. Our new education will supply the need.

One word more and I will have finished. No change is perhaps more noticeable in the new order of things than the attitude of instructor to the instructed. The impassable gulf between professor and student has been bridged by human sympathy. It is no longer necessary to overawe the scholar by a wise and vicious look in order that he may be respectful, obedient, and docile. The reign of the rod is no longer supreme in the hall of learning. Educators now comprehend the teaching of history—that force per se has never planted a truth, never rendered enduring an error in the progress of the human race to the goal of perfect manhood. They trust for respect and obedience to the examples of a clean life and the inculcation of the laws of order and of the mutual obligations of that comity which should exist between the instructor and instructed; for docility to the awakening of an interest in and a thirst for knowledge, without which no progress can be made.

In event of failure in these particulars the student is not consigned, in the opinion of the instructor, to the class of incompetents, but rather is kindly advised by the instructor to seek another head and another heart to do the work in which he has failed.

These changes in educational methods have wrought untold good to the world.

J. E. Stubbs spoke as follows:

It is a great pleasure indeed to find myself in accord with President Bryan's admirable scholarly paper. It seems to me that it is a valuable contribution to the concept of modern education toward which more or less consciously and more or less instinctively we are growing.

Without dwelling in particular upon the points of this valuable paper, I shall undertake to call your attention to the leading features of the paper, but almost wholly from the historical point of view.

And, first of all, I may affirm with Professor Laurie that education in its modern aspect is to be interpreted not so much by the history of its schools as by the history of the national civilizations in which it is embedded or in which it works out toward national ideals. This can best be shown by a brief historical retrospect.

These words—liberal or practical—which come from our lips so readily in these days, are not so recent in educational discussion as we are prone to imagine.

Education was, in its earliest forms, practical and not liberal; and from several points of view we are but going back to subjects which received attention in the earliest ages. Egypt had an industrial education twenty centuries before the Christian era. Likewise Assyria and the other Eastern nations. And this industrial development is readily understood from the fact that, dependent as the Egyptians were upon the inundations of the Nile, the building of canals, systems of irrigation, and a massive style of architecture became of necessity the industrial features of Eastern civilization. Every Egyptian boy was trained to a trade at the hands of his father. So, too, many great works accomplished by the Assyrians—majestic specimens of architecture and extensive systems of agriculture—were developed through the same national need.

If time permitted I might run through the history of other nations. Take China, with an older civilization than either of those I have mentioned. Her prudential system of ethics is still the very genius of her institutions, and the system that made all civic positions open only to her educated classes holds to-day as well, while her neighbor, India, dreaming vaguely of higher things, found in speculative philosophy the ideal of a nation's growth and an entirely different type of character.

It is worth while also to remark in this connection that we find among the Persians in our own particular family of nations the beginning of the individuality which is so characteristic of modern thought and modern life. And when we come to Greece we find the military education of Sparta developed immediately out of the conditions of her environment and her needs, so that the Spartan youth was trained industrially and from a military point of view directly for the defense of the State.

In Athens the reverse was the case. There we see individual freedom and individual ends, but with these activity of preparation for defense against the nations that were waiting to discrown her when the opportunity came.

Passing to the educational systems of Rome—inheriting as she did the political and military experience of the Greek State, and receiving also through Greek teaching the educative influences of earlier national civilization—we find markedly developed in Roman character "manliness, energy, governing power, and a keen perception of the relative rights of men in the matter of property."

So we see that in those far-off centuries—during the pre-Christian period, as named by Professor Laurie—the industrial or practical idea lay at the very root of the system of education, of which abundant illustrations will spring readily to your mind.

This rapid survey is further suggestive of the development of the practical through what we are pleased to denominate in these days the liberal. It calls to mind that the so-called modern movement, to which reference has been made in the paper just read, came from Harvard University, a classical college, and that so early as the decade prior to the middle of this century Harvard sought to interpret the genius of American life and to work it out in her curricula and in the training of her schools. And while it remained for President Eliot, twenty-five years later, to realize this idea, yet I call your attention to the suggestion that in this respect Harvard stood then as she stands now, among the foremost interpreters of the traditions and ideals of our national life. It seems to me that long before the Morrill bill was passed—long before our attention was called directly to the industrial education which is contemplated in the system to which reference has been made in the paper just read, and with which we are more or less familiar, this old, strong university sought to realize the traditions and ideals of this nation in the modification of her curriculum. And we must remember also that as Harvard has broadened and diversified her courses of instruction, she has also made more liberal the preparation and more thorough the training which ought to characterize all our elementary education and, if possible, all our secondary education, and she has advanced the demand for liberal preparation for the direct and specific work of technical and professional schools.

It is worth while also, Mr. Chairman, to note that what we are pleased to speak of in these days as the value of special training—the giving of close attention to

distinct lines of study, to a few subjects well wrought out—is the characteristic distinction of the old English universities. In the English university was emphasized the nature of a discipline, classical though it be, so thorough, so masterly that the development of mind and character under that specific training was deeper, and the scholarship richer, than that which was attained by the broader course of study that was developed in the classical institutions of our own country.

We may notice in this connection the vital influence that Germany exercises upon the educational methods and systems of this country. But it is the characteristic of German thought and German work in the field of education that German statesmen and scholars seek to apply scientific method and scientific thought to the development of the educational system and educational ideals, perhaps too strenuously; for there are even in that majestic system of education partial failures that lie open to the mind of the thoughtful student.

But when we shall have attained to the conception which we consciously as well as instinctively seek to realize in the educational life and thought of our own country, we shall find that this conflict of studies which has stirred the thought of other nations than our own—this violent opposition—will cease, and in this new concept we shall find in harmony all these apparent conflicts.

If Matthew Arnold be right when he says in regard to education, that it has for its end that the student may know himself and may know the world—when that comes to be fully realized it will be found that he has well said that in the aptitude for the humanities and the aptitude for the study of nature, there will come this higher concept in which there will be more or less complete unity where to-day there seems to be marked opposition in our educational thought and our educational life.

Note for a moment that this same question has been up in Germany during all these years of the development of her secondary and her university training. It is only within recent years that the larger and stronger German universities have closed their doors to the special student, requiring that there should be credentials from the gymnasia of the Empire in order to secure admission. For a long time encouragement was given to the students of specific subjects—to students not graduates of the gymnasia—in order that they might have the benefit of the universities. Only within recent times, because of the growing number of students and of the founding of numerous technical schools, have the university doors been closed to others than the graduates of the gymnasia.

Germany has sought to realize this same liberal and industrial ideal by the creation of secondary schools of different types. First came the gymnasia—the classical schools—schools designed to prepare the student to enter the university—schools embracing a nine years' course, including eight years of training in Latin and seven years in Greek, with such an arrangement of work in mathematics and science as shall give the student upon entering the university a well-rounded, liberal education.

But German scholars, in working out this ideal, found that they did not meet all the needs of the individual student or the life of their people. So there grew up next the Real Schule—retaining Latin, but substituting for Greek the modern languages, English and French, and with a larger amount of science and mathematics, so that when the student finished the course in the Real Schule he would be prepared for technical training—for the specific course of study which he desired to follow.

And then there was organized the Hohere Burgere Schule—the higher citizens' school—for the training of young men directly and by shorter means for business and trades.

According to recent statistics a little more than 90 per cent of the population of Germany never get beyond the elementary schools.

So we find in Germany a movement toward the same ideal which, as we note in the discussion of this paper, has been sought in the educational processes of our own country—how so to adjust our scheme of higher education that we shall reach a common result along different lines.

Although agreeing in the main with the paper to which we have just listened, I can not accept wholly the definition of culture and its relations as there worked out. True it is that culture is not an end, but a means, and a valuable means; and I apprehend that whatever differences of opinion may arise are rather in the definition or understanding of the term. Culture is but another word for cultivation. It is the term that we apply to the harmonious development and discipline of human powers. And while there is a discipline that comes from arduous thought within definite bounds and subjects, is there not, sir, another view of the subject as suggested in Arnold's definition—the knowledge of oneself and one's relation to the world. This is not simply an aptitude for the knowledge of nature nor simply a drill in the aptitudes for the humanities. The universities of the country have another means of training than simply by their established course of studies. The very life of a university is a cultural training of the highest value. Its atmosphere, its ideals, its purposes all combine to work out a type of character that is to be interpreted in the light of the national ideals.

You remember that when Lessing, a provincial boy, went from the broad and thorough training of the classical school of Meissen to Leipsic, he found pedantry at a premium in the classroom of Leipsic University. Like Goethe he found the dry-as-dust spirit predominant there. Lessing, the reformer of thought in the eighteenth century—that pioneer in demanding freedom of thought—was repelled by this pedantry. He found himself also out of tune with the surroundings of that fashionable city. This country boy deliberately and with marvelous insight said to himself, "I will not only know myself, but I will know myself in relation to others." So he set about training himself to be a cosmopolite, a citizen of the world—to know himself as a man and to know himself in the relations of society—as a man with men.

This illustrates, I think, the point in my own mind and which I have sought to bring out. Sir, has there ever been in the history of the universities any time equal to the present in the cultural advantages which they offer? I venture to say there never has been as much manliness in spirit and in character among students of American and foreign universities as there is at this very time; that there never was a higher ideal among students; that there never was a stronger movement in the student bodies of our universities that made for the knowledge of oneself and the world than at the present time. If a university does not, in connection with her curriculum, thus give real culture to her students, she is failing, in part, of her highest privilege, and she will fall short in the interpretation of her academic life as it should be interpreted by the movement of our national civilization. To illustrate: Our commencement address was made this year by one of the distinguished graduates of the University of Virginia—a lawyer in the city of San Francisco. In conversation he gave me a deeply interesting account of the history of the University of Virginia and her student life—an account which afterwards, at my suggestion, he put upon paper. Let me turn for a moment to the academic life of that old institution. A student there may go into the examination room and receive his paper and sit down to his work with no one to watch whether he is honest or not. When the hour comes for him to dine he may pass out of the examination room to his meal and back again and resume his work without a word being said. There is no such thing as conversation between him and his fellow students affecting the examination. If he were so much as to suggest any topic relating to the examination—to ask or to give aid—he would by the sentiment and authority of the student body be dismissed from the university without action of the faculty. What has made possible there and, I think, in one or two other institutions of the South, this noble feature which has been largely absent from many other institutions of our country? It is simply because the ideals of student life so assiduously cultivated for many years in that portion of our country have made a student there first of all a gentleman, because what he receives of academic honor and academic credit must be earned by his own honest efforts, untruthfulness or dishonesty not being tolerated among gentlemen.

This, sir, is what I mean when I speak of this idea of culture in its relation to our academic life and the character that is cultivated in such an environment, which breathes into the student life such ideals as will bring the highest results in the refinement and honor of character.

As I brooded this afternoon over the topic of this hour, walking along the Mall, I found myself at every turn attracted by the majestic column known as the Washington Monument. Plain, even severe, in its simple architecture, yet sublime in proportion and elevation, it towers toward the heavens. And I thought of him whose name and character are here idealized before the eyes of every passer-by. Washington, without the benefit of an academic education, studied carefully during his early life that he might gain culture for himself and by this means know himself and know his relations to the world and to the men about him. He who, in company with his fellows, rode with the hounds across the Virginia hills, over fence and over brake; he who was attracted by the surpassing beauty of the American girl or the American woman; he who liked a game of cards, and who (tell it not!) swore a little when occasion demanded—this country gentleman, when he stood in Congress confronting the cultivated, intellectual, scholarly men of New England, impressed his strong personality upon his distinguished colleagues. It is said of him that no manlier man than "Col. George Washington" ever appeared in that body. This self-trained, this cultured man towered above them all in that breadth of spirit and that balance of judgment which made him the wise leader in the early days of this country—superior to the scholarly Jefferson and Adams—a man who met the need of every hour and the honor of every position. The man who thus figured in the development of our national life in the early days is to-day a symbol of the majestic simplicity of American manhood, of a type of character that is to be realized in our academic training as well as in the life of the American citizen.

Applying the thought of this discussion to the present time, I may say that while in Germany the industrially trained boy has not the social position which the university-bred man enjoys, while in England the industrially trained boy or girl

still feels to some extent the influence of the social caste system, when we shall come to realize this concept of American education, it will be something of the type illustrated by that majestic column to which I have referred and by the character of him whom it commemorates. Under such influence and as the result of such training the inquiry among our people at large, North and South, East and West, will be simply, "Are you a man? Are you a woman?"—trained and disciplined for some calling which, industrial though it may be, shall entail no caste distinction, but which, by virtue of a cultured manhood or womanhood, shall be a passport to every avenue of influence and high position, social or civic, in this great national commonwealth of ours.

The following paper was read by A. W. Harris, of Maine:

Relation of the Churches to State Colleges and Universities.

The last quarter of the nineteenth century has seen a marvelous development in the general interest in higher education. The increase in the size of colleges, their appliances and endowments is nothing short of wonderful. It has been estimated that private gifts to colleges during the years of the recent hard times have aggregated $100,000,000. There have also been great changes in the methods of education and the courses of study. The elective system has opened a place for the teaching of science and led to the general adoption of the laboratory method. The demands of business have enormously increased the importance of scientific and technical courses and greatly multiplied the number of them.

This development is to be found in all colleges, but nowhere has it been so great and so rapid as in the State and other nonsectarian colleges and universities. Half a century ago there were scarcely any important colleges not connected with some religious denomination. At present the nonsectarian colleges and universities contain 58 per cent of the whole number of college students. Most of what I say will apply to both State and other nonsectarian colleges and universities, but for brevity I will use only the term State university. This growth of the State university is the more interesting because it is probable that it will continue and increase in both size and importance. Time will not allow complete presentation of the reasons for this expectation, but two are so important that they must not be overlooked. The first is found in the curriculum of the State university, which includes not only the usual linguistic and literary courses, but many others, and gives especial attention to those scientific, industrial, and technical courses which furnish the most popular training for business and commercial pursuits, a training which by reason of modern conditions is in greater demand every year. The total number of students in such courses is already very large. President Eliot states that there are at present more American students studying for the degree of bachelor of science than for the degree of bachelor of arts. I confidently expect the number to increase still further, for we are only beginning to understand the value of the higher education outside of the learned professions. The State university is assured of growth, because it attracts a class of students who have not been accustomed to go to college and are not attracted by the classical course.

The second reason relates to income. State institutions derive their income chiefly from taxation; church institutions derive theirs chiefly from invested funds. It is the tendency of income from taxation to rise, but the tendency of income from investment to fall. Accordingly, the income of the State university is likely to increase, and to increase more rapidly than that of the church college. The growth of the State institution is steady because its income is little affected by hard times, and rapid because its income can be quickly increased in response to new calls or new opportunities. The question of income is made all the more important because the new methods of teaching and the new scientific and technical courses, which are the cause of the great part of college growth, are especially expensive.

The first fact, then, to which I call attention is the rapid increase of the State university, an increase which affects the number of students, the breadth of work, and income; and the probable further increase, both absolute and relative, as compared with the denominational college.

A second fact to which I call your attention is the large number of students in State universities who either by membership, family connections, or sympathy may be classed as belonging to the church population. (This fact is brought out by statistics, but is not surprising, since the membership of the Methodist churches is largely drawn from the people who are most interested in those technical and industrial courses for which there is scarcely any provision outside of State institutions.)

A third fact is the failure of the (Methodist) churches, which have done so much for college education under their immediate control, to do anything for the State universities, either by providing religious care and culture for the students who are members of the churches or by embracing the great missionary opportunities to influence the religious life of the whole body of students.

The question then arisos whether the church has any duty to the State institutions and their students. To answer this question we must investigate the reasons which bring the church into the field of higher education. To put the question in another form, Why does the church spend its money in the maintenance of colleges? In the beginning of our history, church and state were generally united, especially in New England, which has wielded an influence in educational matters so strong that for discussion it may be treated as if it were the whole country. This union prevented any discussion of the relative right and duty of the church and state in education. Though the state did not support higher education very liberally, it controlled it, so far as it wished, but usually did so through the church, for the agents of the state were the same citizens who were the leaders in the church.

After a time church and state were divided, and the common schools, which were under the eye of the people and appealed most directly to their interest, fell to the state; the colleges, which had been the especial care of the church leaders, (and found them a faithful friend), fell to the church. Once in the hands of the church it was to be expected that the colleges would remain there. It was equally natural that new denominations, finding their older rivals in the control of colleges, should found colleges of their own to which they might send their boys without the denominational risks which must have been very real and great in the days of heated theological discussion and bitter rivalry.

Thus, through inheritance and imitation chiefly, it came to pass that the protestant denominations, which have always been the earnest advocates of the public schools and often ready to warn all churches out of the field of elementary education, are the supporters of a great number of denominational colleges.

I believe this to be the true explanation of the origin of the system of church colleges in the United States; but it now has little more than historical interest. It furnishes no reason for the more recent foundations and the many sacrifices which the churches are making to maintain their colleges. Reasons there are, but they are still to be found. One of these reasons is inertia, and this may be called first in point of time. The churches had the colleges, and no one questioned their usefulness; on the other hand, men agreed in declaring them not only useful but necessary. And in truth they were necessary, for there were scarcely any other colleges in the country.

A very potent reason for the (founding and maintenance of) denominational colleges was the desire to offset the teachings of other colleges, some of which, belonging to other denominations, were considered heterodox, and some, belonging to no denomination, were considered godless. This cause is of decreasing importance. The divisions between denominations are growing indistinct, and their relations to each other are more intelligent and kindly. Few men would now make the sacrifice involved in the founding of a college simply to offset the teaching of another denomination, though there are some; but most of those among the older men, who believe it necessary to maintain the church college in order to offset the evil influence of State and other undenominational colleges. I do not sympathize with these persons, and for two reasons. In the first place, my experience shows that the influence of the State college is good. Those who know the facts will certainly be slow to call them godless. I know that there may exist in a State university a strong influence in favor of religion, although without any denominational turn. The religious conditions in such an institution are very much like those of the world. Each denomination is on the defensive, and, as a result, each receives the loyal support of its adherents. There is little of the hypocritical and scoffing spirit, which is the greatest danger to the religious life of students in denominational colleges. But it is not necessary to amplify this point, for the position of the protestant churches in regard to the public schools makes it inconsistent for them to believe in the evil influence of the public colleges. It is not easy, on the one hand, to object to the State university, whose students are young men able to think for themselves, and, on the other hand, to advocate the public school, whose pupils are children at the age when most subject to influence and least capable of independent judgment. Either we must allow the justice of the Roman Catholic position on the public school or withdraw objection to the public college. It is significant that officers and presumably presidents of Rochester, Brown, Chicago, Williams, Amherst, Oberlin, Dartmouth, Northwestern, and Princeton have reported these institutions to the World Almanac as nonsectarian institutions whose influence they sometimes are supposed to offset. We need give little attention to the offset argument.

In the second place, I consider the existence of the denominational college as an offset unimportant, because the undenominational college can not be an effectual offset. It can never have an appreciable effect in combating the influence which surrounds students in other colleges; first, because it fights at too long range; and, second, its influence on them and the general public can not be relied upon to remain true to the purposes of its founders. It sometimes becomes a source of the very influence which it was intended to neutralize. The theological schools are an illustration in point. It is well known how Harvard, founded by devout trinitarians,

became unitarian, and this story has been repeated in our own time by the Doshesha College, in Japan, which has troubled so greatly the American board.

A more important reason for maintaining the denominational college is its ability to open the door of opportunity to boys and girls, who but for it might never obtain a college education. The preacher is a recruiting officer, looking for the bright boy, stirring up his ambition, and exerting every influence with his parents to have them send the boy to college. (There are many men who will acknowledge themselves indebted to their church for their higher education, and I am glad to count myself with them.)

Another good reason for maintaining the church college is the reflex influence of the college on the church.

The great reason is yet to be mentioned. The reason which, in my opinion, overshadows all others is the desire of the church to give the student religious care in the critical college period. When we remember the great influence the college men wield, how large a proportion of the world's important positions they fill, how they govern the thought and progress of the nation we must agree that it is wise to spend great time, great effort, and great treasure upon their religious education and culture. In short, then, the reason for the denominational college is the divine commission, "Go (ye into all the world) and preach the gospel." But this question is incomplete. The church was commissioned to preach the gospel to every creature, and if I am correct in my previous reasoning the church does not fully discharge her obligation by caring for the students in her own colleges—she must extend her care to the students in other institutions also.

This duty appeals to the church the more strongly because the students in the State universities are neither enemies of the church nor indifferent to it, but her own children, some of them members of her own communion (and others closely connected by family relations). The number of these neglected sons of the church, who, like Topsy, are simply left to grow, is greater than often supposed. For instance, the University of Maine has about half as many Congregational students as Bowdoin, the Congregational college of the State, and about one-third as many Baptists as Colby, the Baptist college of the State. Yet the Congregational and Baptist denominations which do not hesitate at great expense for their own colleges, though most of it is for secular subjects to students, a large part of whom do not belong to their denomination, spend not one cent to provide religious care for the large number of their own faith who are students at the State university. The situation in Maine is paralleled in other States. The University of Minnesota has more Methodist students than Hamline University, and more Congregational students than Carleton College.

Nor should it be said that these students have forfeited the consideration of their churches by turning from their colleges. Many of them attend State colleges, doubtless, because they will, but also because they must. In some cases there are no colleges of their own denomination within convenient distance, and they have preferred the State university to a college of another denomination. In other cases they wish instruction of a kind not given in the church college. The church colleges offer very few, if any, opportunities to students who wish to pursue technical courses; and, speaking broadly, their work in science is very inferior to their classical and literary courses.

But, it may be asked, is there any way in which the church can influence the religious life and thought of the State university? I answer, yes; if she will enter the university and share with it the student's education. If she is to have real power she must do her work in the most direct way—at the place where the students are and by personal contact.

Are there any methods of work which will give the church the desired influence without conflicting with the natural attitude which the State must maintain toward all denominations? (I believe methods can be found, when they are looked for.) When the church attacks the problem she will find methods. (Some of them will be tried and abandoned.) Lest my contention be thought visionary, I wish to suggest some methods which seem to me entirely practicable. I have arranged them according to ease of adoption.

Courses of sermons or lectures and addresses on religious topics by prominent and able men might be arranged. General church funds might be appropriated to local churches to enable them to make their services attractive and profitable to students and to provide denominational rooms and services like those maintained by the Young Men's Christian Associations. The churches might assist the university Christian associations by providing proper buildings and facilities for their work. Religious books and papers might be sent to the university reading rooms and libraries.

The church might furnish the funds to provide the universities with preachers and pastors. Cornell University (an undenominational and State institution) provides at her own expense a series of Sunday afternoon sermons by leading preachers taken from different denominations. The interest manifested by the students is

great, and the president expresses his hearty approval of the result. (Among the representatives of the Methodist Episcopal Church have been Dr. Buckley, Bishop Warren, and Bishop Vincent.) If the expense, or a part of it, could be provided for other State universities would be glad to adopt the same plan.

Harvard University goes further and employs a board of distinguished clergymen representing different denominations to act in turn, each for a month or two, as resident pastor and preacher. These gentlemen preach to the students on Sunday, take charge of the daily chapel service, and maintain office hours when they welcome students for personal conversation. (Bishop Vincent has several times represented the Methodist Episcopal Church.)

The church might encourage the formation of church clubs like some at the University of Michigan, which maintain regular meetings and from time to time invite distinguished speakers to address them.

The political parties have found ways to do missionary work in the universities, and what they have done the church can do. The most important suggestion I have to make is borrowed from a politician. Thomas Jefferson, writing of the University of Virginia, said: "We suggest the expediency of encouraging the different religious sects to establish each for itself a professorship of their own tenets, on the confines of the university, so near that their students may attend the lectures there, and have the free use of our libraries and every other accommodation we can give them. This fills the chasm objected to ours, as a defect in an institution professing to give instruction in all useful sciences. And by bringing the sects together and mixing them with the mass of other students we can soften their asperities, liberalize and neutralize their prejudices, and make the general religion a religion of peace, reason, and morality."

Professor Ely, himself a graduate of a denominational college and now a professor in the University of Wisconsin, in an address before the convocation of the University of the State of New York July 5, 1893, elaborated Jefferson's idea, and suggested that the denominations maintain, upon the campus of the State university or near it, halls or dormitories which might be made most useful religious centers.

Such a hall should be in the charge of one or more teachers of intellectual rank with the best in the university, and with salaries commensurate with the influence and the dignity which they ought to maintain. The teachers might offer courses on the Bible, church history, and other subjects, and under proper regulations these courses might count toward the university degree. In addition to these courses the halls might provide other courses by nonresident lecturers, and in many other ways provide for the religious welfare of the student. The teacher should be appointed by the denominations, which should pay his salary, but subject to the approval of the university authorities, and might exercise many of the privileges of the faculty. When means are at hand the hall might become a dormitory, furnishing a home for students and yielding an income for the support of its work. Such dormitories would bear a resemblance to the colleges of the English universities, which were originally called halls.

It might sometimes seem wise to allow the hall to offer some courses in lines not distinctively religious, such as mental and moral philosophy and, perhaps, literature. This change, allowing the churches to select their representatives from a greater number of teachers, would be a real advantage, since the personal influence of the teacher would be quite as important as his teaching. In some cases a theological school might be developed in connection with the hall. Such a school ought to have a great influence upon the religious life of the university, and would in turn enjoy the advantage of the university courses, library, and other equipment. Experience might sometimes justify the churches in expanding these halls into what may be called parallel colleges, teaching whatever subjects they saw fit, and arranging for the admission of their students to university courses in other studies. Degrees might be granted by the college and university jointly. Boston University has for many years reversed the latter part of this arrangement and granted her degrees to the graduates of the Massachusetts Agricultural College. I do not see why such a college would not yield to the church all the advantages of the separate college. Why would the churches care to teach studies which neither affect the religious belief and life nor are affected by them? There is no such thing as Presbyterian chemistry or Baptist botany or Methodist physics. This method would have the advantage of great economy. Without any cost the students of the parallel college would have the advantages of the university, its library, museum, laboratories, and teachers, and would share in the broadening influence of a great institution, representing all sections and all beliefs. The parallel college would be wealthy with an income on which the separate college would starve.

These plans are not visionary for they are not wholly untried. There has existed for many years in proximity to Harvard University an Episcopal divinity school. The Christians have a Bible College in association with the University of Missouri, and are planning for others at the University of Washington (State) and at Chicago University. The University of Toronto, a State institution, has federated with it

four colleges representing the English, Methodist, Presbyterian, and Roman Catholic churches. These colleges have representation in the university senate, and a voice in matters relating to the course of study and government of the university, certain options in the university curriculum, and the advantage of university courses and facilities for their students. The president of one of the colleges states that his college exercises a strong influence in the university, especially over university students connected with the church, and that the university exerts a strong and healthy influence on the students of his college, who gain in largeness of view and breadth of sympathy by association with others. His experience shows that this policy is the best for the student and his education, best for the denomination, and best for the general cause of education. If he had a million dollars he could use the whole of it wisely in supporting a theological school in connection with the university; in establishing lectureships on ethics, the relation of science and religion, and Bible instruction for undergraduates; in establishing tutorships for backward men, and providing scholarships especially to encourage theological students to pursue a full arts course; in building residences for students, of his denomination, and in providing means for wholesome social intercourse, etc.

Now, finally, I am persuaded duty is not satisfied when the church, standing in the midst of her colleges and universities, says to the student, "come," but requires that she go to the colleges and universities of the State and preach the gospel, first to him that is of the household of faith, and then to every other creature also.

The CHAIRMAN. The subject which has been treated in the paper read is now open for general discussion. The more I have heard of the subject the deeper to my mind has become its significance. I have heard the epithet "godless schools" hurled against our State institutions almost ever since I entered the schoolroom. Yet the institution from which I graduated, a State institution and under State control, was absolutely dominated through its board and faculty by the Presbyterian Church.

I suppose that our land-grant institutions, representing as they do the practical side of education, will be more liable to the charge of godlessness than any other of the higher institutions. I believe that the moral and religious training of our young people is of exceeding great importance, and I have always felt that the importance of this subject can not be ignored even by the executive head of a State school.

My friends, I can not but feel the force of the Scriptural inquiry, "What doth it profit a man if he gain the whole world and lose his own soul?" There is nothing which so offends my sense of propriety as to hear some of my fellows occasionally—thank God, only occasionally—say that they regard this subject as of secondary importance; that we should allow the churches or religious organizations to look after the moral well-being of the students; that our business is to develop the intellect, to train the faculties for the practical exigencies of life.

I hope that we shall have a prompt and emphatic discussion of the subject which has been so well introduced.

J. L. SNYDER. The able address before this section yesterday emphasized the changes taking place in higher education very clearly and forcibly. All the addresses pointed to the fact that the State universities and technical schools are fast encroaching on the territory formerly held by the denominational colleges. If there ever was a spirit of rivalry and jealousy between these two classes of institutions it has almost, if not entirely, passed away. The church as a church does not oppose State institutions. It may in some instances be a little fearful of the religious and moral influences of certain institutions under the control of the State, yet, on the whole, the attitude of the church toward our State schools is one of friendliness and cooperation. The church has perhaps as many of its members and adherents in attendance at our State institutions as it has in its own colleges. Why, then, should it not be friendly to the State university? The church, like any other organization, must take care of its own members. Because a certain portion of them decide to attend the school maintained by the State rather than by the church colleges is not a sufficient reason why the church should not show further interest in them. It must follow them up and, if possible, keep them interested in the work of the church to which they belong. The best method of accomplishing this end must be left to each denomination. That is a matter wholly in the hands of the church. As the State

school recognizes the claims of religion, it will gladly welcome any agency that may have for its object the religious instruction of the students intrusted to its care, so long as such agency does not interfere with the rightful constituted authority of the college.

The able paper to which we have just listened presents this case from the standpoint of the church. It elaborates a system which, if it had been adopted by the church before so many denominational colleges were established, might have been very effective. If the church had the means, after taking care of the schools which it has already established, to build halls at our State universities and employ the services of one or two good men to look after the spiritual needs of the students, no doubt that much good would be accomplished for the church. But the church is poor and in most States can not afford to add much to its educational responsibilities. Perhaps in some of the newer States the churches may affiliate to good advantage with the universities in accordance with the plan proposed. The church certainly should endeavor to hold all its young people who seek an education at State institutions. I am of the opinion that there is no more effective way in which to do this than to place in the pulpits of the university cities or villages the strongest preachers in the church. Let each denomination select its ablest men to preach to college students. If the church organization nearest to the school is not strong enough to support such a man, let it receive help from the boards of the church.

The question from the standpoint of the church has been ably handled, but I would like to hear it discussed from the other side—from the standpoint of the State university—by those present who are especially qualified to speak on this question from years of experience at the head of such institutions. How to keep the Christian young men and women intrusted to our care true to the profession which they have made; how to bring those reared in irreligious homes to appreciate and perhaps accept the great truths of the Christian religion—these are questions which often rise to perplex those in whose charge these young people are placed. We often hear of godless schools. I say hear of them, because we seldom, if ever, see them. Our State universities, while perhaps not permitted, and wisely, too, to teach religion, are permeated with religious life and Christian feeling. A very large percentage of the teachers are earnest Christian men and their influence is strongly the one way. From my limited experience I know of no better way to influence these young people in the right direction than, first, for the faculty to set a good example. It is the subtle, silent influence of the teacher that is the most lasting. Chapel prayers will not convert many pupils as long as the members of the faculty are quarreling with each other. Students are not likely to be found in church on Sunday if the faculty are strolling over the country collecting specimens for their Monday classes.

Second. The faculty can do much good by encouraging and assisting the student religious organizations. The Young Men's Christian Association and the Young Women's Christian Association have become great factors in the religious life of most colleges and universities. They are doing much in the way of training men and women for active Christian work, and should have the strong individual support of the faculty.

Third. The college authorities should endeavor to affiliate with the churches of the community. At the opening of the school the names of all the new students should be sent to the pastors of the respective churches which each prefers to attend. Students should be encouraged to find a church home and actively engage in church work.

Some large and wealthy institutions support college pastors, but I doubt whether better results would not be secured if the same means and effort were put forth both to assist the student religious organizations and to encourage them to support and attend the church of their choice in the city.

These are the methods pursued in the college over which I have the honor to preside. We would gladly welcome suggestions from any source which would enable us to make this work more effective.

M. H. Buckham. When I first saw this subject on the program I was somewhat surprised that it should be introduced into the proceedings of this convention.

It seemed to me a very difficult and delicate subject to handle, but I begin to see now the reasons why it is appropriately introduced. I appreciate the delicacy of the question; and I hope I may not offend anyone in what I may say.

It seems to me that in this discussion we may well assume two or three things. One is that a permanently denominational college is in this age of the world an anachronism. We all know that there have been good reasons for the establishment of such colleges as pioneer institutions. But that they should be permanently denominational they themselves apparently seem to deny when they advertise, as most of them do, that there are members of all denominations in their faculties, and that their instruction is not denominational.

It seems to me we may also admit that the secularization of education is the keynote of our civilization; that the divinely appointed sources of religious instruction and influence are the home and the church. I do not consider it the duty of the college as such to care for the religious nurture of its students. I should think it too great a responsibility to accept such a trust when I have not the power to perform the trust, because the very act which makes me the president of a State university takes away from me the power of exercising such religious care and nurture as a responsibility of this nature would seem to involve. I think we must go upon the principle that our children, in order to be religiously taught, must be subjected to religious influence first at home and then in the churches. The objection which I should make to some of the propositions we have listened to to-day for a religious establishment in our colleges is that in my view it would tend to a kind of esoteric religion—a kind of religion which is peculiar to students. The natural inference would be that students as students are a different class of Christians from others and need a different kind of religion. I would much rather see our students active members of the churches and participants in the religious nurture and influence of the church than to have either a college church, which would necessarily involve an esoteric religion, or this variegated and miscellaneous kind of church influence or religious influence which would come from the aggregation of the various denominations.

So I am entirely in accord with President Snyder in his suggestion that the best thing that churches can do for the colleges is to get the young men into the churches, into opportunities for church activity, so that the churches may give to them the same kind of religious nurture and care and instruction which they give to all men. I was never more pleased in my life than when, while attending a meeting of our mission at Burlington, I found that out of fourteen instructors in the mission school, nine were college men. The discovery of this fact was much more gratifying to me than if some one had given me a sum of money with which to bring big preachers to preach to our students. It showed to me that the churches were finding out that they were useful and efficient auxiliaries of the colleges, that there was a mutual helpfulness between churches and students. Our practice at Burlington is, when new students come to us, to have the president of the Young Men's Christian Association take a census of such newcomers, asking them, "What is your church home? With what denomination have you been accustomed to worship?" And then report the student to the ministers of the churches with which they have respectively affiliated; and then the ministers look up these young men and persuade them if possible to connect themselves with their churches. In this way they are treated not as students but as human beings, as Christians, as men who have souls like other people; and in proportion as their influence is greater, they get this higher influence in their Sunday schools and in their church work.

It seems to me that we confuse ourselves and create trouble in connection with this question when we think of students as a special class to have special religious influence brought over them. We want to humanize them; we want to treat them like other men—as the equals of all other men in the sight of God. The best thing for the churches to do for the universities was beautifully expressed, I think, by a good, plain

man in one of our meetings for prayer at the college. He said he thought that the best thing the churches could do for the university was to embosom the university and its students in the prayers of the churches.

J. H. Canfield. I wish to say "amen" to what President Buckham has said. It seems to me he has given an extremely rational presentation of this whole matter, following almost identically step by step the course of action pursued in the institution with which I happen to be connected. We have complained for a great many years—some of us at least—that there seems to be a great gap between the student and life as he finds it after he leaves the institution. We have talked for a long time about that "dull thud" with which a student falls from the commencement platform to the world outside. We have said that it appears almost impossible to give the student any suitable measure of preparation for the life that he is to take up after he leaves the university. I think the trouble has been because we have generally considered that the student in the university is preparing for life instead of considering that he ought to begin life about the time he comes to the university. Certainly he is old enough then to begin to live, and it is time that he should begin. It is certainly a part of his education to take his life very largely into his own hands. He is then perhaps for the first time in his life master of himself in a very large degree. He is to control the use of his own time; he is to set himself about his tasks in his own way. We ask him to be present at certain hours for lectures and recitations, and certain hours for laboratory work; beyond that we say very little to him. He no longer has continually upon his shoulder somebody's hand directing and controlling him. He is out of his swaddling clothes and at least reasonably upon his feet.

Now, it is unquestionably better that he should begin to live when he enters the institution than that he should simply set about preparing to live or continuing the preparation for life. And I think his beginning to live involves his touching just as far as he possibly can all those phases of communal life into which he must enter after he leaves the institution.

This is why I think there is a peculiarly large amount of that unusual kind of sense—good common sense—in what President Buckham has just said in regard to the position of students with relation to the churches. In our university we follow, and always have followed, to a large extent the plans that have been already outlined. We send lists of the students' names to the clergy and the churches, especially those in the immediate vicinity of the university; we put forth every effort imaginable to bring the student within their influence.

Every church or denomination within reach of any university ought to be to a very great extent a sort of normal school for the special training of the student while he is at college in the religious phase of his life. He ought to be able to find there better organization, better methods, more effective work, than he has ever seen before. And he ought to be able to take back to the church of his choice with which he is to act after he leaves college the results of that experience. It is infinitely better that he get this experience from the churches of the community than by any other process whatever—certainly better than that you should undertake to "corral" him or put upon him any special mark or brand while he is under your control and direction.

I believe that an infinite amount of good can be done by the churches if they will simply see to it that every church within reach of the university, every church that can properly be said to be in touch with the university, is strongly organized, well controlled and directed, well equipped, and doing in every respect the work that the churches of to-day ought to do and must do if they are to command the respect and allegiance of strong men and strong women, of whom we are getting a greater and greater multitude every year. I think the very first thing we ought to do, those of us who direct or influence at all the churches of our choice or others, is to bring about on the part of the churches a feeling that it is a dangerous thing to put a weak minister or a weak church anywhere within the reach of a college or a university. When they see that and see it clearly—when they put forth their very best

efforts along the lines of those churches that are to come into contact with the students of the colleges and the universities—they will be doing a work which will be infinitely better, in my judgment, than any work which can possibly be done in any other way. I well recall the remarks of able men who have been at the head of churches in our university towns, that the large number of pews in excess of the apparent needs of the church came to them by a sort of divine ordination and arrangement in order that they might be able to open the church largely and freely to the students of the adjacent institution. I think that if every church felt something of that spirit—if every church recognized that it is its duty to provide in a large and generous way for these young people—the churches would do the best work that they possibly can do in this direction. Put these students directly in touch with life, exactly as they will find it after they leave the university. Do not make a distinction between the life of the student and the life of the outer world. Do not make a distinction between the student and the active member of the ordinary, well-organized and active church.

W. I. CHAMBERLAIN. There does not seem much left to be said after the speeches to which we have already listened. For forty-five years I have been very close to some college all the time either as a student, professor, trustee, or president, and I have noticed that those institutions that coddled the student, treating him as a peculiar being with peculiar needs, have failed, while those institutions which have treated the student as a man, as a worker, as a citizen in every respect, have succeeded. I would treat a student as a citizen in every respect, not only in regard to his religious matters, but in regard to his criminal matters, if you please. If it is criminal for a body of young men to do a certain thing in the city or in the country, then it is criminal for them to do it in the college. I would bring the law of the land into operation upon students just exactly as I would upon any other class of citizens. If they conspire to blow up a building they should be indicted as any other individuals would be for a similar crime.

But that is aside from the question here. I simply meant to enforce the idea that students are men, citizens, workers, and should be treated as such in all the relations of life—should be made to stand erect as men.

A. B. PEEBLES. We in our little school on the hills of Connecticut do not have this problem presented to us in just the same form that it is presented to other institutions, because we are not within the reach of any church except the little church a few rods away from our building, which happens to be a Congregational Church. The community about there is small, so that the people can not have the quality of preacher that we feel the students ought to have, and this has occasioned us a good deal of thought and anxiety. We have recently entered upon a new plan by which we have secured a very excellent man. But in order to do this—I do not know that it is any secret—our board has agreed to pay $400 for sittings for the students in the church. The question was raised by an excellent man within a few miles of us of whether it was the province of our board, as managers of a State institution, to pay money toward the support of a denominational church. But we say to our students, "You are at liberty to go to any church you may choose; you may go 1½ miles to the Methodist Church, or 2 miles to the Baptist Church, or 4 miles to the Catholic Church, and so on." But, as a matter of fact, the students all attend this church, which is within a stone's throw of the college, and we are wondering whether we are making a serious perversion of the funds of the institution or not. We feel that our policy is right and in accord with common sense, and so we are going ahead on that line. I have wondered how many institutions represented here require their students to attend church. We are somewhat old fashioned, and we still require all the students to attend church once on Sunday, and the people who are our constituency do not object to this. It is agreeable to them. I should be glad to know how many colleges do compel their students to go to church at least once on Sunday, and whether this use which we are making of $400 for the benefit of the students is proper and right.

J. E. Stubbs. I understand President Harris's paper in its essence to set forth two propositions. First, the duty of the churches to follow their students to the State university and see that they receive proper care and direction from the standpoint of the churches—supervision and guidance in their religious life. If I am correct that proposition of the paper is the one to which President Buckham and President Canfield and Dr. Chamberlain have spoken, and spoken very effectively. And I wish to add here, in passing, my most hearty indorsement of the statement made a few moments ago that there is only one code of ethics for the student in college and out of college; that there is no peculiar law of ethics for the college student as distinguished from any other citizen. That point has been very ably emphasized here.

But the second proposition set forth in this paper is one to which attention has not been further called. I apprehend that the questions presented here are connected inseparably with the conditions existing where we have received our training or where we are now doing our work; and these conditions are materially different in different parts of the country.

I understand the second proposition in this paper to be simply an economical one—how the churches from their point of view may secure the advantages which these great State institutions, with their ample endowment and ample equipment, enjoy, and not be compelled to establish weak church colleges. Of course it is possible to establish a church college with a course of instruction in the classics and mathematics; but this is not possible under existing conditions with limited means. Now, this paper touches upon a question which is a live question on the Pacific coast, so far as church colleges are concerned. It is but a few months since I was in conference with leading members of my own church in the city of San Francisco with regard to this very problem. We have about 30 miles from the city of San Francisco a weak college of the Methodist Episcopal Church—I mean weak in its equipment. The Methodists as a body on the Pacific coast are poor, and it has been impossible out of the scanty means of the membership of that church to provide an adequate equipment. Yet that college has upon its right hand and its left two great institutions like the University of California and the Leland Stanford University—the one soon to come into possession of a patrimony that will make her rich beyond any expectation that she has had during the past few years; the other soon to come into possession also of a large revenue.

Now, you can not keep students from Methodist homes from taking advantage of these great institutions, and we would not keep them away if we could. Now, the proposition of the paper, as I understand it, is that the churches, at least under these conditions, instead of establishing weak colleges, shall take advantage of these great State universities and plant beside them such church organizations with such arrangements and under such conditions as will enable students to realize their ideal of religious training from the standpoint of the churches and yet bring them into close relation and sympathy with the wise and effective teachings of these strong institutions—sending them into the laboratories and class rooms of those institutions, where they will come into contact with every phase of mind and thought. The influence of such a state of things, instead of being a narrowing influence, would be the very broadest influence. I would rather have had my own theological training under such conditions in connection with a great university than to have had it in a strictly theological school shut off in the woods 50 or 100 miles from the city of New York. It is best for the student to be brought in contact with the liberal and liberalizing minds of men of all views, provided there is also the careful guidance of wise, thoughtful, scholarly men representing the ideals and the teachings of the churches.

That is the very problem we are dealing with in our part of the country. And one church has already taken advantage of the opportunity thus presented. The Christian Church has established in connection with the University of California a lectureship with one of her foremost men in charge. Courses of lectures are given

on the Bible to those who wish to attend, and credits in connection with this course of study are accepted in the university. This outside course of instruction has thus a vital relation to the work of the university. And so young men of that denomination are coming to the University of California for their education. I learned recently from a reliable source that President Gilman, now of Johns Hopkins University, then of the University of California, recognizing the existing condition of things, conferred with leading men of the different denominations in California upon the subject of establishing an affiliated line of colleges such as are outlined in the admirable paper of President Harris, so that the University of California might be able at once to give the benefit of its ample resources and the teaching ability of its class rooms to the training of young men whose parents desire that they shall have direct religious culture under the influence and direction of their own church. I believe that this magnificent plan of President Gilman is in the near future to be realized, so that instead of the churches establishing weak schools they will plant these auxiliary colleges under the wing as it were of the State University and the Stanford University. Thus the State will give its wealth of advantages in the form of scholarship and equipment for the benefit of these young men, and at the same time the church will keep its hand upon the heart and brain and conscience of its best young men. And I shall not be alarmed at all if we specialize a little along the line of religion as well as along some other lines.

SECTION ON AGRICULTURE AND CHEMISTRY.

The Section on Agriculture and Chemistry met in Willard's Hall at 2 p. m. Tuesday, November 15, 1898, and was called to order by the chairman of the section, R. J. Redding.

J. L. Hills, of Vermont, was chosen secretary pro tem.

W. I. Chamberlain, of Ohio, read a paper upon "Recent investigations, together with former experiments, on the relation both of commercial fertilizers and of clover to wheat growing in Ohio."[1] In this paper, and in subsequent remarks, the author quoted statistics which he believed tended to show that there has been a relative decline in clover growing and an increase in the acreage and yield of wheat in Ohio. This increased production of wheat he believes to be due largely to a more liberal use of commercial fertilizers. The direct purchase of unmixed fertilizing materials for cash at wholesale was considered impracticable as a rule although sound in theory. The author stated that in his opinion the attitude of some of the experiment stations has seemed to be antagonistic to fertilizers, and that he deplored this state of affairs.

The paper was discussed by C. E. Thorne, W. H. Jordan, C. F. Curtiss, I. P. Roberts, W. Frear, E. B. Voorhees, J. A. Myers, and B. C. Buffum.

C. E. Thorne cautioned against hasty generalizations on this subject, pointing out that increased wheat production has not in every case been associated with increased use of fertilizers in Ohio, but that improved methods of culture may in some cases account for the increased yield.

The position taken by the experiment stations in regard to the fertilizer business was discussed by several speakers.

W. Frear said: "The farmers of eastern Pennsylvania, by organizing and buying for cash in large quantities, have been able to purchase some of the ingredients of fertilizers at prices a number of dollars less per ton than the prices quoted in the wholesale price lists of establishments in New York City. Certainly the farmers dealing singly can not purchase from the fertilizer's agent at any such advantageous

[1] This paper has been published in a series of articles in the Ohio Farmer.

rates. I have no carping to vent here against the fertilizer business in general and the results of its activity upon the farmer; but I do think that in those States where the purchase of fertilizers is an important factor in farm expenditure, it behooves us to do what we can in aiding the farmer in the intelligent application of fertilizers and the intelligent purchase of them. This, I think, is the attitude assumed by most of the experiment stations; nothing beyond this. Their position is one which certainly needs no defense."

W. H. Jordan stated that he knew "of no set of men who are dealing in the great necessaries of life, like flour and groceries, who are resorting to the expedients and arguments resorted to by the agents of the fertilizer manufacturers in order to sell their goods. While I recognize as a fact that there are manufacturers and agents who stand on as sound and dignified a basis in what they say and do as any other class of men, I am personally cognizant of methods and arguments in vogue which make it incumbent upon the experiment stations of our State to secure better methods of trade than those now prevailing; and I believe the New York Station or any station in the Eastern States—I can not speak as to the West—can do for the farmers no better service than by pointing out to them more efficient and economic methods of purchasing plant food. The attitudes which the stations have taken has been not so much directly antagonistic to the purchase of commercial fertilizers as an attempt to point out to the farmers of the Eastern States the value of their home resources. I wish to disclaim, on the part of Eastern experiment stations, as far as I have any authority to speak for them, any such position as antagonism to the judicious and economical use of commercial fertilizers."

I. P. Roberts stated that his experience as to commercial fertilizers was that in some localities they are almost a necessity to good agriculture, while in other localities they seem to have no appreciable effect.

In this connection Mr. Roberts read a paper on "Productivity as affected by tillage," in which it was shown that by the employment of better methods of tillage the soil supplies of fertilizers may be more largely utilized, and thus the necessity for applications of fertilizers may be greatly reduced.

B. C. Buffum gave an account of experiments with fertilizers at the Wyoming Station, which have led him to recommend to the farmers of that State that they plant alfalfa (to increase the nitrogen of the soil) and use more thorough methods of tillage to render the natural fertility more available.

H. P. Armsby presented a preliminary report upon some feeding experiments which have been going on at the Pennsylvania Experiment Station since 1892, directed toward the determination of the amount of food required to maintain an animal without gain or loss of weight. This work is published in detail elsewhere.[1]

On motion of Mr. Scovell, the section proceeded to the consideration of the report of the committee on uniform fertilizer laws.

H. J. Wheeler (chairman of the committee). The first proposition to take steps in the direction of securing uniform fertilizer laws was made at a meeting in which the New England States, together with Maryland, New York, and Pennsylvania, and the Department of Agriculture were invited to participate. That was a year ago last March. At that time a committee was appointed, consisting, I believe, of five members, to further consider the matter. This committee met representatives of the fertilizer organizations in the city of New York to discuss the question of uniform fertilizer laws. At intervals during nearly three days we had a most extended discussion. On some points the fertilizer manufacturers and this committee were at first very much at variance; but finally their views were harmonized, or nearly harmonized, for there were one or two points on which they never did come together.

This committee recommended that the matter be brought before the Association of Agricultural Colleges and Experiment Stations, and also before the Association of

[1] Pennsylvania Sta. Bul. 42.

Official Agricultural Chemists; that each association appoint a committee, the two committees to act in unison, if possible, as a joint committee for the further consideration of this matter. In accordance with this proposition, the committee of which I am chairman was appointed at the last meeting of the Association in Minneapolis; and subsequently, at a meeting of the Association of Official Agricultural Chemists, a committee of five was appointed to represent that body. These committees met immediately upon the adjournment of the Association of Official Agricultural Chemists, a year ago this fall. At that meeting Dr. H. W. Wiley, of the Department of Agriculture, was made chairman of the joint committee. He subsequently appointed three subcommittees of three members each; one to meet the fertilizer manufacturers in the West, one to meet the fertilizer manufacturers in the South, and the other to meet those in the East. The first-named of these subcommittees met the fertilizer manufacturers of the West at St. Louis. The subcommittee appointed to meet the manufacturers of the South did not meet them. The subcommittee appointed for the East met the National Fertilizer Manufacturers Association, or rather a committee of that association, in Boston last May. At that time a session was held which lasted for some three hours, at the end of which time the subcommittee appointed for the East succeeded in bringing the fertilizer manufacturers there represented to look upon the thing practically as they did. These subcommittees reported here in Washington prior to the meeting of the Association of Agricultural Chemists, and recommended to that association the adoption of the points which are embodied in this report. The Association of Agricultural Chemists unanimously adopted the report of the joint committee, which is the report now before you. If the present report be adopted by this Association, we shall then have the same points adopted by both associations. The Association of Agricultural Chemists has appointed a standing committee whose duty it is to see that these recommendations are carried into execution; and it is now recommended that a standing committee of this Association be continued for the purpose of endeavoring to secure some actual results from the work which has thus far been done.

The report of the committee was as follows:

The committee appointed by the Association of American Agricultural Colleges and Experiment Stations to confer with the committee from the Association of Official Agricultural Chemists on uniformity in fertilizer laws concurs with that committee in recommending the adoption of the following as points which should be made uniform in the laws of the several States:

(1) All substances containing nitrogen, potash, or phosphoric acid, sold, offered, or exposed for sale for manurial purposes, excepting the dung of domestic animals when sold as such, should be subjected to inspection.

(2) Each package of manurial substance as above defined, sold, offered, or exposed for sale should bear a printed, legible guaranty.

(3) The number of net pounds in each package should be stated.

(4) Each package should bear the brand, name, or trade-mark, and the name and address of the manufacturer.

(5) The quantities of manurial ingredients should be expressed in percentages.

(6) The guaranteed statements on the packages or forwarded to the inspectors need not be in the form of an affidavit.

(7) Sealed samples of fertilizers offered for sale need not be sent by the manufacturers to the inspectors.

(8) In lots of 5 tons or less, samples should be drawn from at least ten packages, or if less than ten packages are present, all should be sampled; in lots of over 5 tons not less than twenty packages should be sampled.

(9) Duplicate samples should be drawn and sealed in the presence of the party or parties in interest, or their representatives, one of the samples to be taken by the collector and the other left with the party whose goods were inspected subject to the call of the manufacturer.

(10) Total nitrogen should be guaranteed in all cases and nitrogen in the form of nitrates or of ammonium salts should be guaranteed separately if the manufacturer desires credit therefor.

(11) Total phosphoric acid should be guaranteed in all cases, and soluble reverted and insoluble, separately, if the manufacturer desires credit therefor.

(12) Potassium should be guaranteed as potash (potassium oxid) soluble in water.

(13) When chlorin is present in fertilizers, manufacturers shall guarantee the maximum percentage thereof.

(14) Only statements of the minimum amount of the substances present, except in the case of chlorin, should be made. For example, instead of guaranteeing from 2 to 4 per cent of potash, guarantees should read thus: Two per cent of potash.

(15) It should be specified that the methods of the Association of Official Agricultural Chemists should be used for official work.

(16) An imprisonment clause for violation of fertilizer laws should be omitted.

(17) Manufacturers should not be obliged to secure bondsmen.

(18) Commercial valuations should not be affixed to the published analyses of manurial substances.

(19) A definition of the term "brand" should be inserted wherever a brand tax is assessed.

(20) The guarantee should state the ingredients guaranteed, in the following form and order:

——— per cent phosphoric acid soluble in water.
——— per cent phosphoric acid reverted.
——— per cent phosphoric acid insoluble.
——— per cent phosphoric acid total.
——— per cent nitrogen in nitrates.
——— per cent nitrogen as ammonia.
——— per cent nitrogen total.
——— per cent potash soluble in water.
——— per cent chlorin.

Ingredients not present should be omitted from the guaranty and no other form of statement should be interpolated.

It is further recommended that this committee be continued as a standing committee on fertilizer legislation.

Respectfully submitted.

H. J. Wheeler.
H. P. Armsby.
E. H. Jenkins.
M. A. Scovell.
C. D. Woods.

The report of the committee was adopted as submitted after considerable debate, especially on section 11, participated in by W. P. Brooks, M. A. Scovell, E. B. Voorhees, S. W. Johnson, W. I. Chamberlain, H. J. Wheeler, H. A. Huston, H. P. Armsby, I. P. Roberts, and W. A. Withers.

J. S. Newman read a paper upon the "Relation of the land-grant colleges to experiment stations, viewed from the standpoint of the agriculturist."

H. J. Wheeler read a paper upon "The possibility of drawing erroneous conclusions from plant-soil tests," an abstract of which follows:

The conclusions of this paper are based upon the results of plant-soil tests at the Rhode Island Station. These tests have been continued for nine consecutive years. Twentieth-acre plats of land were employed, separated from one another by paths 3 feet wide. The manurial ingredients applied in the tests were potash, as muriate; phosphoric acid, as dissolved boneblack; and nitrogen, as nitrate of soda. The tests comprised one unmanured plat, three plats with single ingredients, three with combinations of two ingredients, and one with all three. The first four years maize was grown. The fifth year thirty-seven varieties of plants were employed, to see if they would all show the same soil deficiencies. In each of the three succeeding years a limited number of different varieties was tested, maize having been included, except in the year 1895. In 1898 the plats were again devoted entirely to maize.

Before liming a marked deficiency of phosphoric acid was noticed. The seventh year of the test the plats were all limed just prior to planting, but the results nevertheless showed a greater deficieney of phosphoric acid than of nitrogen or potash. The next season phosphoric acid seemed to be far less deficient than either of the other ingredients, and the succeeding year (1898) a similar result was obtained; in fact the yield from the plat receiving nitrogen and potash annually, where maize had in certain seasons made but a feeble growth, was the greatest obtained from any of the plats.

The failure of the lime to liberate considerable quantities of phosphoric acid the first season, was doubtless due, chiefly, to the fact that it was not yet thoroughly mixed with the soil.

The results in 1897 and 1898 indicated that the lime had in some way set at liberty large quantities of phosphoric acid which were formerly comparatively unassimilable. They also indicate that one should not draw conclusions as to the relative deficiency of nitrogen, potash, and phosphoric acid in case of a soil which for physi-

cal or chemical reasons requires liming, unless lime has first been applied to all of the plats involved in the test.

In case of soils requiring liming, a plant-soil test from which lime was omitted could not serve as a safe guide by which to judge of the comparative merits of various chemical methods of arriving at their manurial requirements.

In view of the fact that the soil studied contained more than twice the amount of phosphoric acid which, according to Hilgard, is usually sufficient in virgin soils to insure the profitable production of crops for many years without resort to phosphatic measures, it seems probable that the value of lime as a liberator of inert phosphoric acid may be in certain soils of more far-reaching importance than is generally supposed.

On account of the large areas in this country where carbonate of lime is deficient and the possibility that other such soils may contain similar inert phosphorus compounds, a further study of the subject is contemplated.

This paper gave rise to considerable discussion, participated in by C. E. Thorne, J. S. Newman, W. L. Hutchinson, W. P. Brooks, W. I. Chamberlain, and S. W. Johnson, in which the danger of drawing hasty conclusions from experiments with fertilizers was strongly emphasized.

W. P. Brooks. I have been engaged for some ten years in somewhat similar lines of work to those described in the paper, and I want to say that the results I have reached serve to emphasize very strongly the points which have been made in this paper—namely, that one should be extremely cautious in undertaking to give sweeping and general advice from the results of the experiments of one or two years.

In carrying out soil tests on a somewhat similar plan to that outlined by Doctor Wheeler, I found apparently a very great deficiency of potash. The corn crop of the first year responded to the application of potash alone almost as liberally as to any other application; and farmyard manure was included in liberal amount. Potash alone, if I remember correctly, gave an increase of about 24 bushels of shelled corn to the acre. Next year the increase was 35 bushels, from the application of potash alone

We followed the corn crop with oats, which responded, as you might expect, to nitrate of soda. Clover responded to potash; grass to nitrate of soda. Grass was grown for two years, when the land was broken and planted again in corn. In that year the increase from the application of potash alone was almost as great as it had been before, this being the sixth year of the continuous use of fertilizers. After the corn came rye, which did not show such decided preference for the one application or the other as the preceding crops had done. It responded, however, on the whole more freely and more largely to the application of potash than to any other application.

Thus far there had not been the slightest indication of any necessity for phosphoric acid. But after the rye was harvested in July, and without any further application of fertilizer, white mustard was sown, when, on every one of the plats (there being four) to which phosphoric acid had been applied during the preceding years, the mustard made good growth on phosphoric acid alone. Here was the first crop that responded to this application.

The next year the crop on this land was the soy bean, which responded most largely to the application of potash. The next year an attempt was made to grow onions, which failed on account of bad weather conditions. The soil was already too poor to yield many onions with the very best weather. Under the circumstances the onion crop was a complete failure. Again mustard was sown, which reacted as it had done before. This year we have planted corn, and I now find the reaction or behavior of the crop quite different from what it has been. At the start this year the phosphoric acid plats all took the lead—all plats having phosphoric acid whether alone or in combination; but those plats did not hold their lead. After about six weeks the potash plats began to come forward, and they have given a larger increase with maize this year than any other single element.

In this same series of plats, lime plats and plaster plats were included. The lime and plaster plats are now beginning to show some effect, though not a very great effect.

In another series of plats we had very interesting results with potatoes and onions. In previous experiments potatoes had always shown a very marked dependence upon potash. Last year, upon a plat which had been used seven or eight years in test work, I was surprised to get a much better yield of potatoes on a plat to which during all these years nitrate of soda and dissolved boneblack had been applied than on a plat to which the same two substances and potash had been applied.

I am inclined to think that the continued use of potash—muriate of potash—has depleted the soil of its lime; but this is a point which has not been tested.

There are several very interesting points in connection with my work bearing on this subject of the use of lime. We have a series of plats which for about fifteen years have been manured every year in the same way. They are what we call the nitrogen series. The effects of farmyard manure, dried blood, sulphate of ammonia, and nitrate of soda have been compared. In this series of plats there are three which in all these years have had no nitrogen in any form. Our plans called for clover to follow a crop of oats. In 1897 the oats were harvested, the land plowed, and clover sown the last of July. The clover came up well on all the plats. The growth, however, lasted for only a short time; it stopped growing and turned yellow, and looked so very badly this spring that it was all plowed up. On plowing the land this spring we limed it at the rate of 1 ton of fresh-slaked lime to the acre. Then, after harvesting the oats this year, we once more plowed the land, and it was sown with clover. We have now as magnificent a field of clover as I have ever seen.

We have another series of plats which have been used for about fifteen years for the comparison of muriate of potash with sulphate of potash. During this period nitrogen and phosphoric acid have been applied in the same way to all the plats. Our plans called for clover on that land to be sown the last of July. The summer of last year the clover was sown; it came up well on all the plats; but on those to which muriate of potash had been applied all these years it soon assumed an unhealthy appearance, and by spring there was but little clover on those plats, while the sulphate-of-potash plats looked well.

I again sowed clover in the very early spring on the plats which had previously failed. Somewhat to my surprise, that clover seed came up well and has continued to grow well. To-day the clover on all the plats looks about equally well. No lime has been applied there.

I have stated some of the problems and puzzles which I have encountered. I think they emphasize the point that we should go rather slow in giving advice as to the use of manures.

W. I. Chamberlain stated that he had never seen any benefit from any form of lime in his section of Ohio. He had observed, however, a superior growth of clover on a plat fertilized with acidulated tankage and South Carolina rock over that fertilized with superphosphate.

S. W. Johnson. I am on record in some of our Connecticut reports as having made some comparative observations on the use of leather. Different sorts of leather were pulverized after application of sufficient heat to destroy their natural tenacity, and were also treated with sulphuric acid. While the raw leather is practically worthless as a fertilizer, or probably would not pay the expense of application, the acidulated leather is well up. The reason is to my mind evident enough. The treatment with acid disintegrates the fiber, pulverizes the material, and its mechanical effect is excellent. Beyond that I can not speak positively, because the extent of the concentration of the acid and the time of its action are matters which must have a good deal of influence; and they can not be stated, I presume, with any considerable definiteness. But the action of sulphuric acid on animal matters tends to the formation of salts from nitrogenous material. We have had some beautiful examples of this in our chemical laboratory, where the nitrogen of all classes of animal substances and a great variety of other substances is completely converted into ammonia—actual sulphate of ammonia—by boiling with sulphuric acid.

It is interesting to recall the fact that Dr. Robert Hare, of Philadelphia, who was in a certain sense the father of American chemistry, patented a process for the manufacture of ammonia by boiling animal substances with sulphuric acid. The animal matter of tankage—the muscular fiber, the gelatinous tissue—is of no earthly use to vegetation until it assumes some other shape; hence it has got to be converted by one process or another into ammonia—a result which is facilitated by this treatment with sulphuric acid.

In Connecticut, years ago, the manufacture of fish guano was carried on more or less extensively along the shores of Long Island Sound. There came a time when people who lived within 10 miles of one of those fish-manure factories not only turned up their noses but sent the sheriff to stop the nuisance. Later it was found that by the use of a preparation of oil of vitriol sprinkled over the heaps of animal matter the bad odor could be kept down, the multiplication of maggots prevented, and at the same time the ammonia saved. That process, which was simply a process of acidulation, was adopted as a regular system.

C. F. Curtiss read the following paper on "The significance of stock-feeding experiments:"

The Significance of Stock-Feeding Experiments.

No line of agricultural investigation presents more significant problems for the consideration of the investigator and the practical feeder than the study of the laws governing animal nutrition and their application to economic conditions. The work of the German investigator has been before us for many years, but much of it was not applicable under American conditions. While the scientific principles involved may be the same the world over, their application is not the same in all countries nor even in all sections of the same country. It has remained for the American experiment stations to discover many of these laws and determine their application. Ten years ago the feeding craft was groping blindly on many points that have since been made clear by the stations. Very gratifying progress has been made in this field. In many cases the practical feeder has been disposed to rather lightly regard the general work of this character, but nevertheless the real truth embraced in the scientific findings of experiment station investigators has been quickly accepted as the law of common practice. The revelation of these principles has resulted in the saving of millions of dollars annually. Nature yields her treasures to ignorance very reluctantly, but easily and willingly to intelligence. Ignorance is everywhere expensive in the field of agriculture. The work of the stations has shown the stockman the possibility of producing a pound of higher selling beef at a cost of 5 cents than can be produced by the old methods at 7 or 8. It has shown him the necessity of using good stock and demonstrated that two animals may require the same amount of feed under similar conditions for producing a pound of beef, and one of these animals, by reason of superior excellence of hereditary tendencies toward beef productions, will furnish a product worth 50 per cent more than the other; and, in like manner, that one dairy cow will use 10 cents worth of feed to make a pound of butter that another cow of well-developed dairy function and capacity will produce for 5 cents.

The station work has shown the cost of maintenance and clearly revealed the folly of feeding for maintenance alone when other returns are wanted. It has demonstrated the application of the law of diminishing returns in feeding animals of advancing age as they approach maturity; it has made clear the requirements of the young and growing animal and the requirements of older animals for milk and meat production, the performance of labor, and various other purposes; it has shown what feed can do and what feed can not do, what the animal can and does do with different kinds of feed under varying conditions, and how to use it to best advantage; it has pointed the way to a more rational system of feeding and management, to more economical and intelligent production, and a higher degree of excellence and value in finished products. This work has already resulted in establishing fixed and definite principles for the guidance of the stockman and scientist. These principles are recognized as axioms, and they bring about more exact and scientific work in this important branch of agriculture. And while the work of the stations in stock-feeding investigations has accomplished all this and much more that might be enumerated, the field is only fairly opened.

There is still much speculation and mystery concerning many comparatively simple operations, and doubtless some of the conclusions already reached will not stand the light of future investigations. Many of the results are discordant and not calculated to inspire the confidence of practical stockmen. From a writer in a recent number of a British agricultural journal I quote the following comment on some

American experiment-station work: "It is impossible to too strongly denounce the false teaching of those ignorant American would-be scientists and their followers in this country." The false teaching referred to was the conclusion reached at one of our stations that feed had no perceptible influence in modifying the composition of milk. This writer then proceeded to compare the results obtained at an American station and those obtained from a private experiment conducted in England. While a comparison of the results does indicate a striking dissimilarity, a study of the methods employed in conducting the work of each is decidedly favorable to the station so severely criticised. There are, however, some points in animal husbandry on which the work of our stations is not in entire accord.

Valuable as has been the work of the American experiment stations in this field, we can not be unmindful of the fact that at least a part of the work has been rather too superficially done. A good many of the results and conclusions need to be carefully verified, and some few perhaps need to be conscientiously undone. In this connection would it not be better for the good of the work in hand and the advancement of agricultural science if more of our stations were to adopt the policy of adhering closely to a definite line of work until the results are clearly and conclusively settled? The field of animal husbandry presents many interesting problems that tempt stations to a wide range of investigation, but there is more credit in settling one problem satisfactorily than in turning off a dozen in a superficial manner. Nor should one trial with a limited number of animals ever be regarded as conclusive. There are always numerous variable factors that can never be wholly eliminated from stock-feeding experiments. The methods of investigation even will vary with every worker, and it should be within the province of this association to carefully study, compare, and perfect methods that will insure greater accuracy and reliability of work. As scientists and as practical investigators in this field we can not exercise too great care in methods or be too thorough in verifying results before giving them to the public as conclusive. In accordance with an old maxim, is it not better to know less than to know so many things that are not so? It is true that many findings are published merely as indications and are so designated; but is not even this practice of questionable propriety? It is not indications so much as facts that are wanted by both the scientist and the farmer; and besides, these indications may be misleading unless interpreted with a great deal of care and more than ordinary intelligence. May we not hope to see the time in the near future when the principles and laws of animal nutrition arrived at as the result of careful investigation at the stations will be universally accepted as sound and in every way reliable both at home and abroad?

The stations have already served a most useful purpose in supplementing and bringing the work of the agricultural colleges into public favor and more general appreciation; but they can serve their highest function as a valuable adjunct of industrial education and a means of obtaining and disseminating more exact knowledge only in doing their work so well as to command universal respect and approval.

H. P. Armsby, from the committee on nomenclature, presented the following report:

Report of Committee on Nomenclature.

The by-law governing the work of this committee requires that its recommendations shall be forwarded by the executive committee to the director of each station at least thirty days before the annual convention. Chiefly through the fault of the chairman of the committee it has not been possible to comply with that requirement in the present instance. The committee, however, feels it desirable to submit a report upon two subjects for such consideration or action as the Association may deem it wise to give.

The first of these concerns the definitions reported by Mr. Henry from the Section on Agriculture and Chemistry at the last convention and referred to this committee. These recommendations were in substance as follows:

"*Concentrates.*—That portion of the ration commonly designated as 'grain feed.' It embraces such feeding stuffs as corn, bran, oil meal, and in general the most concentrated portion of the ration.

"*Roughage.*—The coarser portion of the ration, and including such feeding stuffs as hay, corn fodder, silage, and roots.

"By the use of these terms we may conveniently group the components of a ration into 'concentrates' and 'roughage.'"

Since the proposed terms can hardly be regarded as technical terms, but have reference chiefly to common usage, which differs in different parts of the United States, and since no confusion seems likely to arise in the use of such terms, the committee is of the opinion that action by the Association is unnecessary.

The second subject is the nomenclature of nitrogenous compounds. It will be recalled that recommendations concerning this group of substances were presented at the Washington Convention of 1896, but that, objections having been made to

them, they were recommitted for further consideration with special reference to a comparison of the usage of different writers both in English and in foreign languages. A pretty full compilation of this sort has been prepared by the Office of Experiment Stations, through Prof. W. O. Atwater and Dr. R. S. Norris, and their summary of that compilation, with recommendations, is appended to this report. This summary makes clear that the various terms used to designate the nitrogenous substances of plants and animals are employed by different writers with quite different significations, and, furthermore, that our present knowledge of the chemical structure and relations of these bodies is too imperfect to permit of any universally satisfactory classification, and that much further time and study will be needed to reach final conclusions. Meantime, however, the writers of station bulletins and reports must continue to use terms of some sort to designate this class of substances.

In view of these facts, as well as of the further fact that it is not within the province of the committee to deal with the technical nomenclature of the various sciences, but only with the popular use of scientific terms, we feel justified in recommending for present use certain collective terms which may serve to designate the groups into which these substances may be roughly divided, leaving the question of the nomenclature of the individual members of these groups to be decided in the light of future knowledge. The committee, therefore, following in the main the recommendations of Dr. Atwater and Dr. Norris, submits substantially the same recommendations as in 1896, with the addition of the term *proteids* as a group name to include both the animal albuminoids (albumins, globulins, etc., and their derivatives) and the collagens or gelatinoids, and the designation of the nitrogenous extractives in the animal and of the amids and similar bodies in plants, as *nonproteids* instead of *nonalbuminoids*.

The committee recommends the uniform use of the following terms, with the significations appended:

Protein (not crude protein).—Total nitrogenous matter; by current analytical methods, total nitrogen × 6.25 or other conventional factor. Protein is divided into proteids and nonproteids.

Proteids.—A general term for coagulable nitrogenous matter and its cleavage products down to and including peptones and including also the collagens or gelatinoids. By current analytical methods, proteids equal proteid nitrogen × 6.25, or other conventional factor. Proteids are subdivided into albuminoids and collagens.

Albuminoids.—Collective term for the albumins, globulins, coagulated and compound proteids and their cleavage products down to and including peptones.

Collagens, or *gelatinoids.*—A collective term for collagen, elastin, and related nitrogenous bodies specially characteristic of connective tissue.

Nonproteids.—A general term for noncoagulable nitrogenous matter, including the nitrogenous extractives in the animal and the amids and similar bodies in the plant; by current analytical methods, nonproteid nitrogen × 6.25 or other conventional factor. (This term should not be used to designate nonnitrogenous matter.)

The use of the word proteids in the sense given above corresponds most nearly to the general usage of American and English writers, particularly of physiologists. The advantage of thus conforming to present general usage appears to the committee to outweigh the disadvantage of using two terms so similar as "protein" and "proteids."

The term *albuminoids* has been used by some writers to signify the group here designated as collagens. This use of the word, however, is so wide a departure from its original and well-established meaning that the committee has felt fully justified in retaining the term with substantially its original signification.

The following tabulation may serve to elucidate still further the mutual relations of the terms recommended:

PROTEIN { Proteids { Albuminoids. / Collagens, or gelatinoids. } / Nonproteids. }

Respectfully submitted.

H. P. ARMSBY,
For the Committee.

The following paper, written at the request of the committee on nomenclature, was submitted by W. O. Atwater:

SUGGESTIONS REGARDING THE NOMENCLATURE OF NITROGENOUS COMPOUNDS OF ANIMAL AND VEGETABLE SUBSTANCES.

The nomenclature of nitrogenous compounds of animal and vegetable substances is at present in a very unfortunate condition. The terms in common use are employed by different chemists and physiologists in widely different meanings. It might almost be said that each prominent investigator upon the subject has a terminology of his own.

For the present discussion a more or less specific classification will be convenient. The following will serve the purpose, although it is restricted to compounds which are of special physiological interest and omits some classes of these, as alkaloids, ptomaines, and vegetable acids. It is similar to those given by Chittenden, Lusk, and other American and European authorities. A more detailed classification is given beyond.

GENERAL CLASSES OF ANIMAL AND VEGETABLE NITROGENOUS COMPOUNDS.

(1) *Simple proteids.*—Albumins and globulins and their allies and derivatives.

(2) *Compound* or *combined proteids.*—Chromo-proteids, as hæmoglobin; glycoproteids, as mucins; nucleo-proteids, as casein and nucleo-histon, and others.

(3) *Gelatinoids* or *glutinoids* (frequently called albuminoids).—Occurring chiefly in connective tissue; collagen, elastin, creatin, etc., and gelatins derived from them.

(4) *Amids, amido-acids,* and *allied compounds.*—(*a*) More commonly of animal origin; creatin, creatinin, the xanthin and hypoxanthin bases, etc. (*b*) More commonly of vegetable origin, e. g., asparagin, aspartic acid, etc.

(5) *Nitrogenous fats.*—Lecithin, protagon, etc.

The variations in usage are illustrated by a comparison lately made by Dr. R. S. Norris, under the writer's direction, of classifications in a number of text-books and other treatises on physiology and physiological chemistry, including those of Messrs. Chittenden[1] and Lusk,[2] in the United States; Gamgee,[3] Halliburton,[4] Lea,[5] and McKendrick,[6] in England; Wurtz,[7] Schützenberger,[8] and Gantier,[9] in France; Hoppe-Seyler,[10] Krukenberg,[11] Drechsel,[12] and Neumeister,[13] in Germany; Hammarsten,[14] in Sweden; Wroblewski,[15] in Austria, and others.[16] While this is only a partial list of the leading physiological chemists, the disparities in their use of terms are very great. Increasing the list of physiological chemists and physiologists increases the disparity. When writers on general, organic, technical, and agricultural chemistry are included the confusion is still worse.

There are, however, certain general respects in which there is tolerably close agreement. Thus, the distinction between albumins, globulins, and derivatives from these, including coagulated proteids, acid-albumins, alkali-albumins, albumoses, and peptones, is recognized by nearly all the later writers, and the differences in the terms applied to these several groups and to the individual members of the groups are not sufficient to cause any serious confusion. There is considerable difference in the treatment of the nitrogenous compounds which are characteristic of animal connective tissue, and still more in the treatment of some of the less-known nitrogenous compounds. The later writers seem inclined to recognize as a separate class the so-called compound proteids, which contain albumins or globulins or other simple proteids, with nonproteid groups. The greatest diversity is in the use of the terms proteids, albuminoids, and protein.

Proteids.—The term "proteid" is employed by Chittenden, Lusk, and others, including the writer, to cover generally the first three of the above classes, i. e., all the nitrogenous compounds except the amids and the nitrogenous fats. In a stricter sense, however, they confine the term to the first two classes. Allen, Muir, and

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[1] Digestive Proteolysis (1895), p. 29.

[2] American Text-book of Physiology (1896), p. 1017.

[3] Physiological Chemistry of the Animal Body, Vol. I (1880), pp. 16–18.

[4] Text-book of Chemical Physiology and Pathology (1891), pp. 127–137.

[5] "The chemical basis of the animal body," an appendix to Foster's Text-book of Physiology (1893), pp. 9, 10.

[6] Text-book of Physiology, Vol. I (1888), p. 55.

[7] Chimie Biologique, Tome I (1880), p. 73 et seq.

[8] Chimie Générale, Tome III (1883), p. 407 et seq.

[9] Chimie Appliquée à la Physiologie (1874), pp. 235, 236.

[10] Handbuch der Physiologisch- und Pathologisch-chemischen Analyse, Ed. 6 (1893), p. 243 et seq.

[11] Grundriss der medicinischen chemischen Analyse (1884), pp. 28, 29.

[12] Ladenburg, Handwörterbuch der Chemie, Theil III (1885), p. 550.

[13] Lehrbuch der Physiologischen Chemie (1897), p. 42 et seq.

[14] Lehrbuch der Physiologischen Chemie (1891), p. 12.

[15] Ber. Deut. Chem. Gesell., 30 (1898), p. 3047.

[16] See also Allen, Commercial Organic Analysis, 2. ed., Vol. IV, pp. 9–14, 462, 463 (Philadelphia; P. Blakiston's Son & Co., 1898); Watts, Dictionary of Chemistry, revised by Muir and Morley, Vol. IV, pp. 327, 330, 339; and Thorpe, Dictionary of Applied Chemistry, Vol. I, pp. 28, 29. For suggestions regarding the classification of vegetable proteids, see Osborne and associates, Conn. State Sta. Rpts.; Amer. Chem. Jour. and Jour. Amer. Chem. Soc., passim; O'Brien, Ann. Bot., 9 (1895), pp. 171, 543; and Morishima, Arch. Exper. Path. u. Pharmakol., 41 (1898), pp. 345–354.

Morley (Watts Dictionary), and McKendrick use proteids in the same way, bnt McKendrick makes albuminoids a synonymous term. Johnson uses proteids and albuminoids in the second edition of How Crops Grow, 1893, but gives the precedeuce rather to albnminoids as a generic term for the three general classes. Thorpe nses albuminoids generically for the first two classes. Nenmeister, Hammarsten, and Wroblewski nse *"Proteinstoffe,"* Drechsel nses *"Eiweisskörper,"* and Gautier and Schützenberger employ the expression *"matières protéiques."* Gamgee, Halliburton, Lea, Hoppe-Seyler, Krnkenberg, and Wurtz nse no such generic designation. Beside this use as a generic term, the word "proteids" is employed by Gamgee as a class designation for the simple and compound proteids, which he treats as a single class. *"Proteide,"* the German equivalent of proteids, is used by Hoppe-Seyler, Hammarsten, and Neumeister to designate the compound proteids, the simple proteids being called by them *"Albuminstoffe," "Eiweisstoffe,"* and *"Eiweisskörper."*

Albuminoids.—This term (French, *albumenoïdes;* German, *Albuminoide*) has suffered still greater vicissitudes. It was originally employed as a generic designation for the first three of the above classes, and seems to have been adopted by writers in English and French a generation ago as the eqnivalent of the German *Eiweisstoffe* or *Eiweisskörper.* In the first edition of Johnson's How Crops Grow it is used synonymously with "protein bodies." McKendrick employs it iu a like generic sense. The tendency has been, however, to limit it to the first two of the above classes, as the distingnishing characters of the third class have come to be better understood. Drechsel, Wurtz, Gautier, Schützeuberger, and the writer thus apply it to the simple and compound proteids, and the Office of Experiment Statious has adopted the same usage. This signification is maintaiued in the terms "albuminoid" and "nonalbnminoid nitrogen," which are in very general use, and are employed by the Association of Official Agricultural Chemists.

A considerable number of the best-known physiologists and physiological chemists, however, have lately transferred the term albuminoids to the nitrogenons compounds especially characteristic of animal connective tissne, snch as are included in the third class above. Hoppe-Seyler, Krükenberg, and Neumeister, in Germany; Hammarsten, in Sweden; Hallibnrton and Mnir and Morley in England, and Chittenden, Lusk, and Wiley,[1] in the United States, employ the term in this sense, and the usage is adopted in the American Text-Book of Physiology.

The compounds of this third class are designated by Lea as "nitrogenous, noncrystallin bodies allied to proteids;" Gamgee calls them "bodies (so-called albnminoids) related to the proteids;" Alleu has applied to them the term "proteoids," which he nses synonomously with albnminoids; Drechels calls them *"Glutinoide."* Gautier and Schützenberger class the principal ones as *"collagènes"* and as *"matières gelatineuses."* The Office of Experiment Stations has adopted a similar usage in designating them as gelatinoids, a term which is employed by a number of American physiological chemists, including the writer.

Protein.—The terms protein and protein compounds (German *Protein* and *Proteinstoffe*) have been widely used as generic expressions to cover all the nitrogenuous compounds above referred to except the nitrogenous fats, i. e., the first four of the five classes above. It was originally applied by Mulder to alkali-albumin, althongh on the snpposition that this latter was the fundamental constituent of the substauces above desiguated as proteids and albuminoids. It has since becn employed very commonly as a generic designation for these latter snbstances, i. e., the first three of the above elasses, but has gradually come to be nsed by many foreign and most American agricultural and physiological chemists in a still broader collective sense to inclnde the amids also, i. e., the four classes above named, and more especially to designate the hypothetical or, rather, nonexistent product obtained by multiplying total nitrogen by 6.25. It is still used iu these two latter significatious, and more especially in the last by a large number of foreign and most American agricultural and physiological chemists, and many physiologists, while some are inclined to do away with its use altogether.

One obstacle in the way of nniformity of usage is the fact that the present methods of analysis are not satisfactory for distinguishing between the different classes of nitrogenous componnds. This is evidently a cause of one quite common difference of usage between writers upon physiological chemistry, as such, on the one hand, and those who are giving special attention to physiological investigation, especially upon food and nutrition, or to agricultural chemistry upon the other. The man who devotes himself to pure physiological chemistry and deals with individual compounds and classes is wisely careful to distinguish between the several classes of nitrogenons compounds, and to defiue and describe each class in accordance with the latest and best information. On the other hand, the chemist or physiologist who is concerned with the processes of metabolism in the animal and vegetable body is obliged to deal with the nitrogenous substances as a whole. He is limited in

[1] Principles and Practice of Agricultnral Analysis, Vol. III, p. 413.

his methods of analysis by known methods and current usage, and feels it his duty to do his work and state his resnlts in such way as will make them most accnrate at the time and give them as permanent a usefnlness as practicable, but he can not make the distinctions which are possible in special inquiries npon the constitution of individnal compounds or classes of componnds, and in the writing of treatises upon the snbject. The same is true in treating of the chemical composition of food materials from tho standpoint of their nutritive value. It thus comes abont that agricnltnral chemists and those physiological chemists who are engaged in analyses of feeding stuffs and foods, and in experimenting on the nutrition of animals and man, are less particular in distinguishing between the nitrogenous compounds than are those who consider the substances in other relations.

In ordinary laboratory analyses and in experiments upon animal metabolism it is the almost universal usage to determine the total quantity of nitrogen, multiply this by 6.25, and take the product as the measnre of tho amount of nitrogenous materials, giving to this product a certain name, commonly protein. Some experimenters go a step further in their ordinary analyses and attempt to distinguish between the so-called "albuminoid" and "nonalbuminoid," or "proteid" and "nonproteid" nitrogen. It is, of course, very desirable that this distinction between proteid and nonproteid nitrogen shall be clearly defined and practically recognized. One difficulty in the way of so doing in ordinary experimental inqniry is the labor of analysis. This, however, is of much less significance than the fact that we have not had methods of separation sufficiently accurate and reliable to make experimenters snre that the determinations will be of such permanent value as to warrant the labor of making them. It is most earnestly to be hoped that inquiries into this subject will be vigoronsly prosecnted.

The chief difficulty in the way of codification of the nitrogenous compounds is the same as that which prevents the devising of satisfactory methods of analysis, namely, our present lack of definite knowledge regarding the constitntion of the componnds in question. Late research, however, seems to be bringing us quite rapidly toward a better understanding of some of the fundamental groups upon which proteids and allied compounds are built, and to lead ns to hope that a basis for more rational classification and better analytical methods may be furnished before many years. Mnch encouragement in this direction is fonnd in snch inqniries as those of Kossel and others which seem to point to the existence of more or less definite fundamental groups in the proteids and allied compounds. Another promising factor of the situation is the increasing activity of research in this field.

Awaiting such definite knowledge it might seem desirable to attempt to secnre an expression from different chemists and physiologists which would lead soon to a provisional and later to more permanent codification of the terminology of these compounds. If this could be done in such way as would meet with general approval it would be very advantageous. Some of those who are especially interested in the subject have thought it might be well to attempt at once to secure the cooperation of specialists in this country and in Europe in framing a definite code. I have been led to believe, however, that the time is hardly ripe for just such a movement. This belief has come largely from conversations with a considerable number of leading physiological chemists on both sides of the Atlantic Ocean. The larger number with whom I have spoken seem to be of the opinion that it will be well to wait for fnrther developments, in the hope that before many years our definite knowledge will be sufficiently advanced to make a general agreement easier than would now be the case. Meanwhile three things seem evident:

(1) Wo are not to-day possessed of the knowledge of the constitution of the so-called proteids or albuminoids which is sufficient for a satisfactory classification.

(2) There is at least some ground to hope that snch knowledge may be obtained in the near future.

(3) Meanwhile it is desirable to have, at least in the United States, a greater uniformity of usage.

As a part of the discussion needed to secnre more uniform usage, I snggest a plan of arrangement which considers the chemical and physiological relations of the snbstances and the specific and generic terms which may be used. The purpose is to provide a basis for discnssion rather than to propose a final scheme for adoption.

The principal compounds with which we have to do are included in the following tentative classification:

TENTATIVE CLASSIFICATION OF TYPICAL PROTEID COMPOUNDS.

Proteids.—These occur in both animal and vegetable tissues and flnids. The animal proteids are characteristic of contractile tissnc and of blood, milk, and other fluids. They include albumins and globnlins, animal and vegetable; certain closely allied vegetable compounds, as glutenin and zein; acid and alkali albnmins and coagulated products. They are readily solnble either in water or dilnte salt,

acid, or alkali solutions, or in alcohol, and are easily broken up by digestive ferments and other agencies into proteoses and peptones. These latter, as well as the enzyms, are generally classed with the corresponding proteids. They may be divided into—

(1) *Simple proteids*, of which the molecules include or yield on cleavage (*a*) protamins or hexone bases (Kossel), (*b*) aliphatic amido groups, (*c*) aromatic amido groups, and (*e*) more or less sulphur. This class includes albumins, globulins, their vegetable allies, and their derivatives.

(2) *Combined or compound proteids.*—These include, with the simple proteid molecules, constituents which, on decomposition, yield carbohydrate, nuclein, pigment, or other groups. This class includes glyco-proteids as mucins, chromo-proteids as hæmoglobin, nucleo proteids as casein, etc.

The proteids, when used as food, are capable of being transformed into body proteid. They thus build and repair body tissue.

Gelatinoids or glutinoids.—These are mostly of animal origin and are characteristic of connective tissues, as tendon, ligament, bone, hair, horn, etc. They include collagens, elastin, keratin, and neurokeratin. They are less easily soluble than the proteids. Some of them, especially the collagens, are really changed by water at high temperatures (steam under considerable pressure) to soluble gelatin. What is now known of their cleavage products suggests the possibility that future research may warrant their division, like the proteids, into two classes. Perhaps an arrangement more or less similar to the following may become desirable:

(1) *Simple gelatinoids*, of which the molecule would yield (*a*) protamins (Kossel), (*b*) aliphatic amido groups, (*c*) sulphur. To this class belong the collagens, with the corresponding gelatins and the digestion products (proteoses and peptones) derived from them

(2) *Compound gelatinoids*, of which the molecule would yield groups *a*, *b*, and *c* of the simple gelatinoids (with more sulphur) and (*d*) aromatic if not other groups in addition. This class would include keratin and neurokeratin.

The simple gelatinoids used as food are digested and utilized. They are commonly believed to protect proteids from consumption, but not to build or repair proteid tissue. Their incapacity to perform the latter function would be naturally inferred from their constitution, as they lack the aromatic groups which are essential constituents of the proteids. The fact that they must yield kinetic energy when oxidized would explain, at least in part, their power to protect proteids from oxidation. Whether or not they are more efficient in this respect than carbohydrates, and how this superior efficiency, if it exists, may be related to their closer chemical relationship with the proteids, are questions still awaiting definite answer.

Regarding the chemical constitution and the digestibility of elastin little is known. Keratin and its congeners are not sufficiently digestible to be of great value in nutrition. The relation of these latter substances to the collagens suggests that of vegetable compounds classed as lignin to the celluloses. The celluloses are digested to greater or less extent by ruminants and other animals, but woody fiber in which lignin enters as a chief constituent is for the most part indigestible, even by ruminants.

The nitrogenous compounds might be grouped under generic appellations as below:

Nitrogenous compounds	Proteids (or Protein Compounds).	Albuminoids (or Proteids).	Simple.
			Combined or compound.
		Gelatinoids or Glutinoids.	Simple (?).
			Combined (?).
	Amids, amido acids, etc.		

This arrangement seems to me to have several advantages. From the chemical standpoint it accords fairly well, not only with the reactions of the compounds, but also with what is now known of their constitution and their genetic relations. Thus the divisions accord with results of the most interesting and promising researches of Kossel, if I understand the latter rightly from the published accounts that have come to my notice.[1] On the whole, the lines of division seem to be in the directions in which later chemical research implies that the division lines of the future will probably lead. From the anatomical and physiological standpoint the groupings also seem to be reasonably satisfactory. They agree with the distribution of the compounds in the organism and with their physiological functions, including their uses in nutrition.

There is nothing in the system of division which is materially out of accord with views now commonly accepted; and, furthermore, the plan is such as to readily per-

[1] Ztschr. Physiol. Chem., 25, p. 165.

mit rearrangement or transfer of specific compounds, as the results of future research may demand, without disturbing the general order, unless the required changes should be more radical than now seems probable.

The terminology here proposed is certainly not the best that could be devised, nor am I sure that the attempt to fit it to the diversities of existing usage is as successful as it might be, but it will at least serve as a basis for consideration.

A few words may be in place regarding the general terms to which preference is given. The reason for using either gelatinoids or glutinoids, rather than albuminoids, for the compounds allied to gelatin are twofold. The etymology of the term explains its signification, and its use would avoid the unfortunate confusion which comes from taking the word albuminoids from its original and widely employed use and applying it to these compounds.

Whether it would be best to retain the term albuminoids in its older place, as here suggested, seems to me more questionable, especially in view of the number and standing of the physiologists and chemists who have applied it to the gelatin-like compounds. This question could be better decided after conference with a considerable number of persons interested.

The same may be said of the term proteid. I should, however, be inclined to object quite strongly to the restriction of this term to what are here called compound proteids, unless this should form a part of an arrangement to which specialists generally would agree.

Whether the expression protein compounds should be made to include the amids, or should be limited to the compounds here called proteids, would, in my judgment, depend upon the decision as to the use of the word proteids.

I should be inclined to urge quite strongly the use of the term protein for the product obtained by multiplying the total nitrogen by a given factor, be it 6.25, or otherwise, unless a series of factors for different classes of compounds should be found which could be used in such a way that the products, or the sum of the products, thus obtained in a given case should represent very closely the actual nitrogenous compounds. As the factor is now used, the product, though commonly assumed to represent the amount of nitrogenous substances, is actually fiction, for which the use of a term like proteids, ordinarily applied to more or less definite chemical compounds, seems to me undesirable.

Whatever may be the final outcome of this discussion, we have now to decide what shall be done at once to secure as much uniformity as practicable. It seems to me wise to retain for the present such classification and terminology as will involve the least change and come nearest to the middle road through this disputed territory. Such a plan has been adopted by the Office of Experiment Stations and is set forth in several of its publications, as, for instance, in Bulletin 21, page 12. By this plan the gelatin-like substances are designated as gelatinoids. The term albuminoids is applied to what are called simple and compound proteids in the classification above. The albuminoids and gelatinoids are grouped together as proteids. The proteids and amido-acids are designated collectively as protein compounds. The term protein, however, is used to designate the products obtained by multiplying the total nitrogen by 6.25. I would suggest that this terminology, with such minor modifications as seem desirable, be recommended by the committee as a provisional schedule. I would also suggest that arrangements may be made for such further consideration of the subject as may lead to a more satisfactory plan in the future.

The following paper on "Some notes in connection with the testing of cows as to milk and butter production," which had been read in general session by M. A. Scovell, was laid before the section:

Some Notes in Connection with Testing Cows as to Milk and Butter Production.

In 1889 this station began testing cows for milk and butter production. In the early spring of 1891, at the time of the burning of our station building, the records were destroyed. In April, 1891, the experiments were started again, and they have been continuous up to the present time. During this time over 150 cows have been under observation. Some 26 have been under test for a year or more. The data cover yield of milk, percentage of fat in the milk, amount of fat, and food consumed. Cows of various ages have been under test. It has been our object whenever a cow was found to give over the average yield of milk and butter to keep her under as long a test as possible. All the cows under test have been Jerseys. In planning the tests it was thought best to use but one breed, to avoid, as far as possible, irregularities on account of breed characteristics. Jerseys were selected because they far outnumber all other registered cows of dairy breeds combined in this State. The data already collected fills three books of 250 pages each. The plan of the tests covered, first, the study of the dairy cow during long periods for

butter and milk production, and second, the effect of food on both milk and butter production.

I purpose in this paper to take up only the first of these problems, and incidentally to note some observations based on the study of individual cows. To handle the accumulated data in order to bring out the true results is a problem in itself. In order to reach conclusions, the first step necessary is to study individual records. In studying individual cows use has been made of the well-known graphic curves. A considerable amount of such work has been done by us, based on monthly totals, but the further we get along on this basis the more unsatisfactory it seems, and it becomes evident that a change to weekly totals is necessary. On such a basis we have equal periods of time, and influences of season and periods of lactation are better considered. In the study of individual cows I present herewith an illustration with the cow Geneva S. When we first bought her she had just freshened with her first calf. As stated heretofore, the records from 1889 to 1891 were burned, and therefore her study begins in April, 1891, during her second milking period, she having dropped a calf in November, 1890. Summarizing, we have for the six years and one month the following:

Milk and butter record of Geneva S.

	Milk.	Fat.	Butter.
	Pounds.	*Pounds.*	*Pounds*
For six years and one month	48,491.6	2,659.9	3,103.2
Average yearly	7,971.2	437.3	510.2
Average monthly	664.2	36.4	42.5
Average weekly	152.7	8.34	9.74
Average daily	21.8	1.2	1.4
Largest yearly yield (August, 1895, to July, 1896)	10,897.2	585.2	682.9
Largest monthly yield	1,046.1	53.5	62.45
Largest weekly yield	249.5	13.41	15.65
Largest daily yield (August 2, 1895)	37.4	2.13	2.49

Highest percentage of butter fat (November 26, 1894), 8.
Lowest percentage of butter fat (August 11, 1892), 2.5.
Greatest variation in percentage of fat one day, 6 a. m., 2.5 p. m.
Average percentage of fat during whole time, 5.49.

Geneva S. was a cow of large make-up, rather coarse in head, and neck rather thick; long parallel body; hips remarkably wide apart, and ribs well sprung. She was deep at heart girth, with a symmetrical udder, which, if it extended out a little further behind, might be called a model udder. Her teats were well placed. Her skin was of a remarkably rich yellow color; her hide was thick, and her hair rather coarse. Her milk veins were not exceptionally prominent. In disposition she was gentle and not at all nervous. She had a little tendency to beefiness. If fed more than 12 or 15 pounds of grain food per day, even when fresh, she would readily take on fat, in place of increasing in flow of milk. As the records show, her milking periods were quite even as to amount.

In like manner, we are studying the other 26 cows which have been under test for periods of a year or more, and will probably make use of the data accumulated on others for a shorter period. The study of the data has so far progressed as to suggest, among others, the following statements:

(1) That the richness of milk, so far as butter fat is concerned, is inherent in the cow. In other words, the percentage of fat in the milk of the heifer is indicative as to the fat in the milk of the cow. Or, to state it another way, the milk does not materially increase in richness with the age of the cow.

Geneva S. started out in her milk-giving career with over 5 per cent of fat in her milk, and it rarely exceeded this amount in any of her subsequent freshening periods. The average percentage of fat during her whole life was 5.49.

Justa Pogis, another cow we had under test, from her first milking period until her death by milk fever in 1895, gives another illustration as to this fact. When she first freshened her milk averaged 5.2 per cent of fat, and reached as high as 8.2 per cent just before dropping her second calf. When she freshened with her second calf her milk averaged 4.6; at the next calving, 4.7. In 1893 she calved at the World's Fair. Her record there did not exceed 5 per cent. When she calved in 1894, while fresh her milk averaged 4.9. She died in 1895, a day after dropping her calf.

Ino's milk as a heifer averaged 4.9 per cent of fat; at maturity, 5.4 under like conditions.

A heifer purchased from Mr. H. C. Taylor, of Wisconsin, gave for us during her first milking period 6.4 per cent of fat. She has neither decreased nor increased materially from this percentage during two subsequent milking periods.

(2) That the amount of milk of a heifer is not indicative, so far as increase is concerned, of the amount of milk she will give in subsequent periods. Our records show that we have had heifers under observation which have given as high as 32 pounds of milk per day and have averaged over 30 pounds of milk for some time, while others have given not over 15 or 16 pounds. In subsequent milkings the cows giving a small amount have sometimes greatly increased in yield of milk, while others have not, and the same is true with those giving a large amount of milk with their first calf.

(3) That there is a great difference in cows as to uniformity of butter yield during different milking periods. In the case of Geneva S. and Gay Orphan, and some other cows that we have had under test, the yield of butter fat between different lactation periods was nearly the same. In some cases this varied materially. I cite one instance, which seems to me remarkable. In 1894 we bought a cow, Miami Signaldina. She was a good dairy type, and was said to produce 5 gallons of milk per day when fresh. She was bought in June, 1894. In that month she averaged 28 pounds of milk per day and a little over 1 pound of butter fat. From July to November she averaged about 20 pounds of milk and about 1 pound of butter fat. In December she began drying up; she was dry by January. She calved February 18. During March, April, May, and June she gave 4,952.3 pounds of milk and 237.2 pounds of butter fat, an average of 40.6 pounds of milk and 1.94 pounds of butter fat per day; or, adding one-sixth for butter, 2.26 pounds of butter per day. Average percentage of fat, 4.87. During May she gave 1,391 pounds of milk and 67.8 pounds of fat, or 79.1 pounds of butter. Her largest daily yield of milk was 49 pounds. In December she was dry again. She calved on the 1st day of January. Her highest yield of milk on any day in January was 22 pounds and her average per cent of fat was 4.98, and this was her best record during this period of lactation. She seemed in perfect health and ate as much as before, but her food went to flesh. She calved again in November, 1896, and while she increased a little over her former lactation period the increase was not material.

(4) That the milk of cows giving 4 gallons or more of milk per day, when fresh, varies more in percentage of fat from milking to milking than does the milk of those giving a less amount.

(5) That the milk of cows of a highly nervous organization varies more as to percentage of fat than the milk of those of gentle, quiet dispositions.

(6) That when a cow in full flow of milk drops suddenly and materially in her yield the percentage of fat likewise decreases, and, per contra, when the amount of milk increases the percentage of fat increases. This statement is true only when the cows are in full flow of milk and when not in a feverish condition.

(7) Any rise of temperature above normal in the cow causes a decrease in the flow of milk, but an increase in percentage of fat, often to a marked extent.

(8) That, the period of lactation being the same, cows give the richest milk in November and December and the poorest in April and May.

(9) That vigorous exercise or sudden change of environment, or both, causes generally an increase in the percentage of fat in the milk of cows. In most cases when cows are sent to the station for test, especially when they have to walk some distance, the percentage of fat in the milk is greater on the first day than any subsequent day. The milk yield may or may not be less.

Of the many instances to illustrate this I give the following, which is most marked in this respect: On October 18 of this year a cow was sent to the station for test. She was led about 4 miles. Her yield of milk at night was 10.8 pounds, percentage of fat 9.8. In the morning her milk was 11 pounds, percentage of fat 16. Amount of fat for the twenty-four hours, 2.84 pounds; estimated yield of butter, 3.29 pounds. Her temperature at 2 o'clock was 102.4. Apparently she was not a nervous cow; was gentle and would follow anybody around in the pasture, but she seemed homesick; would not associate with the other cows, and would stand at the gate where she was brought in watching an opportunity to get out. We kept her for three days and sent her home because of her homesickness. During the three days after the first day she made less than a pound of butter per day.

This paper was very fully discussed by I. P. Roberts, C. F. Curtiss, and others.

SECTION ON HORTICULTURE AND BOTANY.

The members of this section met in the red parlor of the Ebbitt House at 4 p. m. Tuesday, November 15. The meeting was called to order by the chairman, S. T. Maynard. In the absence of the secretary, W. E. Britton was elected secretary pro tem.

B. D. Halsted spoke on the "Relations of climate and rainfall to the prevalence of fungus diseases," as follows:

I have no written paper, but desire to bring out a plan I am working upon in connection with fungus diseases and climate. The following table gives the data contained in one of three charts which I have in course of preparation:

Rainfall, in inches, during the growing season, April to September, for ten years.

Month.	Year.										Average.
	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	
April	5.32	2.65	2.19	2.49	5.21	3.09	4.88	1.35	3.79	3.74	3.47
May	4.09	4.24	2.97	5.04	4.07	7.72	2.85	3.21	5.68	7.00	4.69
June	3.73	3.59	2.92	3.85	2.95	2.28	3.24	5.46	3.38	2.10	3.35
July	10.19	5.62	5.30	4.03	2.72	1.66	4.26	5.50	11.42	4.96	5.57
August	5.18	4.90	5.32	3.63	6.52	2.58	2.53	1.83	4.39	5.36	4.22
September	8.36	4.75	2.46	1.81	3.20	7.46	1.07	4.37	1.65	2.00	3.71
Total	36.87	25.75	21.16	20.85	24.67	24.79	18.83	21.72	30.31	25.16	25.01

The chart, from which the above table was prepared, represents only one side of climate, namely, rainfall. I have other charts in course of preparation for temperature and for sunshine or cloudiness. On this chart we have what we may call the six months of the growing season. The rainfall is made up from the reports of about fifty or sixty observers throughout the State of New Jersey. I was surprised at the uniformity of the rainfall, thinking possibly there were one or two months out of the six that had much less rainfall than the others, but when we study the figures we see there is not much difference, or, in other words, there is no dry month and no very wet month in the year, as far as these ten years are concerned, in the State of New Jersey. I notice also that almost half of the rain falls in the six months of the growing season and the remainder in the winter season. Where there is a light rainfall in the summer there is a corresponding light rainfall in the winter, and where we have a heavy rainfall in the summer we have a heavy winter rainfall.

Now for some observations concerning certain striking downpours. Take the year 1889. By reference to the chart you will find that in July there was a very heavy rainfall, 10.19 inches. There was also a heavy rainfall in September. These two months make up a large part of the total rainfall of 36 inches. You will find a corresponding heavy rainfall for 1897, and also in July, when we had 11.42 inches as the total rainfall for July of 1897. The September of that year was dry. The next very heavy rainfall is in May of 1894 and the next in May of 1898. Let us see if we can find any parallelism in the abundance of parasitic fungi and the rainfall. Let us see if we can find anything in 1889 that corresponds to 1897. Those of you who have been at work upon subjects of this nature—watching the crops, in other words—for a term of years, will, I think, recollect as the matter is brought to you that in 1889 throughout the eastern part of the country there was a remarkable rot of the Irish potato. In New Jersey the crop was almost destroyed, in some parts of the State entirely so. One of my first bulletins was upon the subject of potato rot, the nature of it, and something about the manner of treating the disease. In 1897 there was a demand for that same bulletin. We did have an outbreak of the potato rot in 1897, corresponding very closely with that which occurred in 1889.

In 1889 the mildew of the Lima bean was discovered by Dr. Thaxter and named by him in that year. It was almost unknown until we came to 1897, and the great outbreak in New Jersey, and elsewhere probably, but we had no notice of the occurrence of the disease in connection with (I will not say caused by) the heavy rainfall in July.

In 1894 New Jersey was swept from one end of the State to the other by fire blight. Nearly every apple tree and nearly every quince and pear tree was affected. It was that year the Kieffer pear ceased to be understood as "ironclad." Up to that time

New Jersey people thought they had an orchard crop in that pear which was free from blight. It did not blight in 1889, nor in the years intervening between 1889 and 1894, but in 1894 we had a tremendous downpour in May. Fire blight is a bacterial disease that spreads in the spring, and it is possible, I think, to show a relation between it and the wet weather in May, which favored the increase or spread of the germs of the disease. It either developed on the plant and at the right time for the inoculation of the disease or favored the transfer of the disease by the dripping of the rain. Mr. Waite has shown very clearly that the disease is carried by insects from blossom to blossom, but it goes where there is no blossom at all, so that we may associate the development of fire blight with the rainfall which comes early in the season. There was a heavy rainfall in September, but that is so late that whatever influence it has is probably exerted upon the next season. It was in 1897 we had the fire blight again coming to our State. Following this heavy rainfall there was a period of humidity and very hot weather; from May 17 until June 7 there were alternating rains and sunshine, so that the rainfall chart does not by any means tell the whole story.

Now, we had a good deal of potato rot in 1890, but the table shows no unusual rainfall. We had a good deal of fire blight in 1895 and less in 1896, but there is nothing in the table that would indicate it as I have indicated it for 1890 and 1894. It was in June of 1896 that the asparagus rust became known in the eastern part of the United States. It propagated very rapidly in June and July of 1896, and the map shows there was an excess of rain in June and almost an average amount in July, followed by a dry period in August and then excessive rains in September, but the greatest amount of asparagus rust was late in 1897, when we had a heavy rainfall in July of 11.42 inches. There was less of asparagus rust, taking the country as a whole, in 1898. There was a heavy rainfall in May, 7 inches, but that came before the asparagus was above ground, and so did not influence the atmosphere, surroundings, etc., of the plant to induce rust, but the later rains developed the rust. The point is to bring out some relationship that may be established between the weather conditions and the prevalence of these diseases. A wet July would suggest at least that we may look out for the Irish-potato rot. A wet May would suggest that the conditions are favorable for the development of blight in the orchard. In connection with the heavy rainfall in May we usually have an abundance of smut in oats, wheat, and grain generally, and the orchard rusts. I remember in 1889 when we had the heavy rainfall in July, there was a great deal of the orchard rust, and some orchards were almost orange-colored on account of its abundance. There was an abundance of it in 1894 and a great deal in 1898, while in between there was a small amount. The rainfall favors development of the spores, and they are transferred to the orchard and to the apple leaves.

The following paper was read by L. C. Corbett:

Laboratory Methods in Teaching Horticulture.

Nowadays educators do not draw hard and fast lines of demarcation between pure and applied science. In fact, applied science has come to be held in high esteem, not only in the German schools, but in many of our own as well. This is pertinently true of all schools that have been influenced by the industrialism of the Northeastern United States. Although that quarter of our country was the seat of the humanities a half century ago, it was and is, nevertheless, the pioneer in the present widespread utilitarian idea of education.

One reason for the rapid spread of this character of education is found in the expansion of the curricula of our various schools to include, first, the sciences and then the purely industrial arts, such as the various branches of engineering, architecture, dairying, agriculture, and horticulture.

The fact that such schools can give the theory of any one of these arts or sciences, together with some practical training illustrative of each principle taught in a better way and in much less time than the old apprentice system, accounts in a great measure for their growing popularity and rapid progress. The demand for technical training is constant and increasing, but notwithstanding this some of the branches falling under our consideration (agriculture and horticulture, in particular), have not as yet been reduced to as accurate a working basis as many of the coordinate branches taught in the same school. For instance, there is not a mechanical or physical laboratory in which instruction is offered but what employs a given well-matured plan of illustrative and instructional exercises, which are designed not only to give the student skill with his hands, but an exposition of the practical logic of the development of a machine. In fact, these exercises are the deductive psychology of mechanics, physics, etc. Why not, then, approach our agricultural and horticultural teaching in the same way? I admit that the great factor—life—with which we have to deal in all branches of biological study renders the laboratory plan a

more difficult one. Physiological botany, however, comes to the aid of both agriculture and horticulture in so far as they deal with plants, and the use of fowls for the study of feeding and breeding problems will greatly facilitate matters, as quick returns are given in both departments to which I have referred.

With this purview of the conditions confronting us and the recourses we have at our disposal, let us consider a few specific cases before proceeding to conclusions regarding the advantages or disadvantages of such methods of instruction.

I may be excused in this audience for drawing my illustrations from my own department of work. In a course in plant propagation which is supplementary to the work in pomology and olericulture I have occasion to discuss different methods of grafting. After a consideration of these topics and a detailed description of the various methods the student is then taken to the laboratory to put his teaching into practical execution. After several trials of this plan, and as many failures on the part of certain individuals (I do not mean that every one in the class failed), I have come to the conclusion that it would be far more satisfactory to the instructor if students were given lessons in the art of grafting as a preparation to the description, even of the different styles, and most certainly before the theory of the art is discussed. If the exercise anticipates or precedes the discussion in the class room, the student is prepared to listen with increased attention, because he understands from experience with the objects what is being talked about. Then, too, the mind is particularly retentive of facts which are brought to it in a twofold manner. By that, I mean that an idea or a perception communicated by oral or written description might be easily lost, but had the description been anticipated by a demonstration it would become indelibly fixed.

But just here I wish to explain my idea of the word demonstration as used in this connection. Nearly everyone who gives oral instruction carries with him to the lecture room every subject or device which will serve to make his meaning more intelligible. This is one mode of demonstration, and it is much better than none, but it is not to be compared in its results with that method which brings the student in actual contact with the material. The mere fact of associating the idea with the object or some attribute of the object greatly aids the memory. Then, too, the preparation of parts and the act of joining them together not only leads the mind by successive stages from part to part, but the logical conclusion of the mind, which is exemplified in the completed whole, is led up to by the successive steps in the exercise. If this is science, it is also logic. Yet this last-named subject is classed among the humanities or culture studies. If they are culture studies, why not combine their study with that of the subjects in which their phenomena are expressed and in that way establish the beautiful relations existing between the various departments of study, instead of stimulating a warfare between them? Strife and contention, as a rule, result from misunderstanding. This, as I see it, is the cause of the strife or opposition which teachers of the useful arts have had to encounter from the teachers of the so-called classics. Those persons who contend against the substitution of the sciences for the other subjects are, in a great majority of cases, persons who have never had any training in the sciences or arts underlying them, and who know nothing of them. On the other hand, there is hardly a college-bred man working in any department of science but that has had at least a superficial training in many of the so called culture studies.

Benefits which accrue to the student from laboratory exercises are first quickened perceptive faculties; the power of concentration and experience in formulating theories from observed phenomena.

The first of these results is greatly influenced by the individual aptitude of the student, and the teacher must devote his attention to the idiosyncrasies of the student. The general plan of an exercise can often be slightly modified to suit an individual who does not readily grasp the meaning of it as explained in the laboratory outline.

Laboratory work is objected to because of the time it requires. To my mind this is one of its chief merits. Not because it requires the expenditure of time merely, but because it requires the student to confine his attention to a given idea or line of thought for a greater period than can ever be taken in class exercises of any other nature. This has a tendency to cultivate one of the most important qualities of mind for student or investigator—concentration. The degree of concentration which one may expect to attain as a student will depend upon the nature of the subject and the manner in which it is presented. The drawing of proper conclusions is the most important work of the student, be he young or old. In this the study of the useful arts surpasses all other branches, because the forces with which we have to deal are governed by immutable laws; the phenomena produced are the results of, or conclusions from, facts and consequently the result is truth.

There is, then, no assumption, no hypothesis, which lacks the prestige of previous demonstration. In this, then, I claim that laboratory exercises are superior to any other method of study yet invented. Laboratory methods teach the student to see

what he looks at, a much rarer faculty than one at first realizes. This is an important consideration, for, unless the observer sees correctly, his ideas will be awry and his conclusions false. Accuracy in methods, then, follows as another attribute of laboratory work. The result of continuous accurate observations, based upon correct interpretation of causic phenomena, must lead to truth; but the student must see what he looks at; this with correct judgment will alone reach truth. These qualities are a natural gift to some, others may acquire them to a large degree, and still others, while they can never become original investigators, will acquire the power of seeing what is pointed out to them. Even this will make one's life fuller and richer from the increased enjoyment of nature's treasures. Nature is only beautiful to eyes capable of seeing, and ears trained to the pitch of her music. These qualities do not come from the reading of such things in books, but from actual contact with nature herself. In this the laboratory and the field are the best schoolroom.

Following Mr. Corbett's paper there was some discussion, bearing upon the subject of teaching horticulture, in which S. T. Maynard, S. M. Emery, L. C. Corbett, J. Craig, C. A. Keffer, C. O. Townsend, and H. J. Webber took part.

The committee on cooperative tests of different races of peaches submitted the following report:

A Report of Progress by the Committee on Cooperative Work in Testing the Different Races of Peaches.

Your committee on cooperative work in testing the races of peaches, appointed at the last meeting, begs to make the following report of progress. For this work the committee selected twenty-four experiment stations, representing four distinct lines across the United States, running north and south. Two lines east of the Mississippi River, one on each side of the Alleghenies, and two west of the Mississippi River, one on each side of the Rocky Mountains. Many of these stations are also on closely related parallels. While the committee is fully aware that these twenty-four points do not represent all the changes and conditions of soil and climate in the United States where peaches may be profitably grown, still, the committee confidently believes that most valuable results will be obtained by this cooperative work, results which it would not be possible for any one experiment station to obtain by itself.

The following varieties of peaches, representing the five races, were selected by the committee for this work:

Peen-to race:
- 3 Peen-to.
- 3 Angel.
- 3 Waldo.

South China race:
- 3 Honey.
- 3 Pallas.
- 3 Early China.

Spanish race:
- 3 Cabler Indian.
- 3 Texas.
- 3 Victoria.

North China race:
- 3 Chinese Cling.
- 3 Elberta.
- 3 Mamie Ross.

Persian race:
- 3 Alexander.
- 3 Mount Rose.
- 3 Old Mixon Free.

It was learned later that Early China and Texas varieties could not be obtained of the one nurseryman first recommended, consequently the committee selected, as substitutes, Imperial for Early China and Onderdonk for Texas. These two varieties do not alter the plan first adopted.

Instructions were given to set, prune, and cultivate these trees like other orchard trees.

The blanks adopted by the committee for taking notes were those used by the Division of Pomology of the United States Department of Agriculture.

After the plan for the experiments was adopted by the committee an outline of it was sent to the Director of the Office of Experiment Stations by the chairman of the committee, with a request to forward it to the twenty-four experiment stations selected. This Dr. True did, accompanied by the following note: "At the request of the committee on cooperative work in testing the different races of peaches, appointed at the last meeting of the Association of American Colleges and Experiment Stations, I send you herewith a letter from this committee setting forth the plan of work decided upon and inviting the cooperation of your station. I also send a number of blanks prepared by this Department, which are recommended by the committee for use in this work. The Department will undertake to report the results of this cooperative investigation as far as the public interest may seem to demand.

Kindly inform me of the action taken by your station in this matter." This request was sent January 13, 1898.

The following are the stations requested to cooperate, accompanied by the information received from those that replied:

Alabama—will cooperate.
California—will cooperate.
Delaware—will cooperate.
Florida—no answer.
Georgia—will cooperate.
Indiana—climate not suited.
Kansas—will cooperate.
Kentucky—no land suited.
Maryland—will cooperate.
Michigan—will cooperate.
Mississippi—no answer.
Nebraska—will cooperate.
North Carolina—will cooperate.
North Dakota—climate not suited.
New Jersey—no answer.
New York (Ithaca)—will cooperate.
Oklahoma—no answer.
Oregon—no answer.
South Carolina—will cooperate.
Tennessee—no answer.
Texas—will cooperate.
Virginia—climate not suited.
Washington—will cooperate.

Should any station desire to undertake the work now the committee would be glad to hear from it.

The committee appreciates the willingness of the honorable Secretary of Agriculture to publish the results of the work "as far as the public interest may seem to demand," and also Dr. True's assistance in helping to forward the work in several ways. It should be stated also that the Chief of the Division of Pomology has kindly agreed to have the fruit from the different races painted in their natural colors so that colored plates could be made from them if thought desirable. He has also offered to have notes taken on the fruit from the different stations by the same expert, if it be sent to him.

Respectfully submitted.

R. H. Price,
E. J. Wickson,
L. R. Taft,
G. H. Powell,
Committee.

The subject of fruit testing by experiment stations was discussed by S. M. Emery, L. C. Corbett, G. H. Hicks, G. H. Powell, J. Craig, W. E. Britton, H. J. Webber, and R. A. Emerson.

S. B. Green submitted a book on forestry, and a letter sent by him to S. T. Maynard, explaining the work, was read by the secretary. P. H. Mell, J. Craig, S. M. Emery, L. C. Corbett, and B. D. Halsted discussed the subject-matter of the book, and it was voted that the Chair appoint a committee of three to examine the work and report. L. C. Corbett, of West Virginia; P. H. Mell, of Alabama, and S. M. Emery, of Montana, were appointed upon this committee. The committee submitted a report commending the work of Professor Green in the preparation of text-books.

J. Craig presented the following rules for pomological nomenclature, as adopted by the Horticultural Lazy Club of Cornell University, and published in American Gardening, 19 (1898), p. 712.

Proposed Code for Pomological Nomenclature.

form of names.

(1) The names of a variety of fruit shall consist of one word or, at most, of two words.

(*a*) In selecting names simplicity, distinctiveness, and convenience are of paramount importance. Pitmaston Green Gage and Louise Bonne de Jersey are neither simple nor convenient. Gold, Golden, Golden Drop, Golden Beauty, and Golden Prune, all given to different varieties of plums, are not distinctive.

(*b*) The use of such general terms as seedling, hybrid, pippin, buerre, damson, etc., are not admissible.

(*c*) Nouns must not be used in the possessive form. McIntosh's Red, Crawford's Early, Bubach's No. 5 must be written McIntosh Red, Crawford Early, and Bubach. The name of no living horticulturist should be applied to a variety without his consent.

(*d*) Numbers are to be considered only as temporary expedients, to be used while the variety is under trial.

(*e*) An author publishing a new variety should use the name given by the origi-

nator, or by the introducer, or else should choose the oldest discoverable local name, providing such name may be conformed to these rules without loss of identity.

(2) In the full and formal citation of a variety name, the name of the author who first published it shall also be given.

(*a*) Names would then take such forms as the following: Summer Queen, Coxe; or Sophie (J. W. Kerr, Cat. 1894); or America, Burbank, New Creations, 1898, page 5.

(*b*) It is expected that such citations of names will be used only in elaborate works on pomology, in scientific publications, or in cases where they are necessary for clear discrimination of synonyms.

PRIORITY.

(3) No two varieties in the same group shall have the same name, and the name first published for a variety must always be used to designate it. All names subsequently published must stand as synonyms.

(*a*) The term "group" as here used shall be held to designate the large general groups specified by words in common language, such as raspberry, plum, apricot.

PUBLICATION.

(4) Publication consists in the public distribution of a printed name and description, the latter giving distinguishing characters of fruit, tree, etc., or in the publication of a new name for a variety properly described elsewhere.

(*a*) Such a publication may be made in any book, bulletin, report, trade catalogue, or periodical, providing the issue bears the date of its publication, and is generally distributed among nurserymen, fruit growers, and horticulturists.

REVISION.

(5) No one is authorized to change a name for any reason except when it conflicts with these rules.

After the reading of the rules they were discussed quite fully by H. J. Webber, G. H. Hicks, G. H. Powell, B. D. Halsted, P. H. Mell, L. C. Corbett, J. Craig, and W. A. Taylor. It was suggested by Mr. Halsted that the Lazy Club have copies of the rules printed and circulated after amending them according to the suggestions offered by the members of the section; also that illustrative examples be appended. It was voted that the Section on Horticulture and Botany voice its appreciation of the efforts of the Lazy Club in preparing this code of rules.

It was also voted that the Chair appoint a permanent committee of five to have charge of matters pertaining to horticultural nomenclature; that this committee be known as the "committee on nomenclature." The committee is F. A. Waugh, of Vermont; J. Craig, of Iowa; W. A. Taylor, of Washington, D. C.; L. R. Taft, of Michigan; and G. H. Powell, of Delaware.

At a joint session of the Section on Horticulture and Botany and the Section on Entomology, November 16, the subject of inspection of nursery stock and trees was considered, the discussion being opened by a paper by W. E. Britton, as follows:

Nursery Inspection in Connecticut.

Connecticut has never legislated against the San José scale. Early in 1893 the legislature passed a bill creating a peach yellows commission, providing for the inspection of all peach orchards of the State and obliging the owners to destroy the diseased trees which the commission had condemned. The law placed the matter largely under the control of the State board of agriculture. The commission was appointed by the board, and the selection of deputies as well as the regulations under which the work was prosecuted were subject to the ratification and approval of the board.

The law, though not quite satisfactory in all respects, was probably one of the best laws ever enacted for the purpose. It was repealed in 1897 by a legislature composed of men who believed in economy and retrenchment, especially along agricultural lines. During the four years that the peach yellows commission existed, 1,883,123 trees were examined, and 99,714 of them were condemned and presumably destroyed. The total expense to the State for this work was about $18,750, or less than 1 cent per tree. The proportion of diseased trees as indicated by the number of trees condemned was reduced from 10 per cent in 1893, to 2.8 per cent in 1896. This reduction can fairly be placed to the credit of the legislation and of the peach yellows commission that executed the laws. But there are many persons who, being

entirely ignorant of the disease, would not believe that such a disease existed. To them the law was only the ratification of a pretext to deprive them of their natural rights and privileges as given them by the constitution. About the time that the peach yellows law went into effect, an effort was made to suppress bovine tuberculosis in Connecticut. A cattle commissiou was organized and the tuberculin test administered to herds throughout the State. This legislation caused even more dissatisfaction than the yellows law, and met with a similar fate in 1897. So that it would probably be rather difficult at this time to procure in the State of Connecticut any legislation for the suppression of San José scale or other insect or fungus pests.

Since the scale was first discovered in Connecticut, in June, 1895, the experiment station has endeavored to gather all the data possible regarding the distribution and spread of the insect, different food plants, etc. Many orchards have been visited and remedial treatment prescribed and applied. The State is infested to a considerable extent, the scale having been found all along the southern coast from New York to Rhode Island, and north through the center of the State as far as Hartford. It seems to have been distributed along the line of the New York, New Haven and Hartford Railroad.

Recently several of the nurserymen have requested that some one from the station examine their stock for San José scale, desiring that, if no scale were found, a certificate to that effect be granted. Though no definite policy had been decided upon, it was thought best to comply with these requests for several reasons. It afforded an opportunity to gain more definite information regarding the status of the insect and to come in contact with the Connecticut nurserymen.

As no entomologist is employed by the station in an official capacity, this work naturally fell to the horticulturist. Two nurseries were inspected during 1897, and no scale was found. Since January 1, 1898, the writer has visited 10 nurseries, three of these examinations being made in February and March, and the others in October. The latter requests were called forth by the New York inspection laws, which prevent the consignment of stock to parties within that State unless accompanied by a certificate. Similar laws are in effect in two or three other States, and Connecticut nurserymen do not wish to be debarred from shipping stock into these States. San José scale has been found in three Connecticut nurseries.

In the absence of legislation and likewise of any settled policy on the part of the station, the inspector is occasionally obliged to exercise his judgment in rendering decisions in special cases. Many conditions arise that are difficult to meet with absolute fairness to all concerned. A few cases may be cited as an illustration. In one nursery a few infested apple, pear, and hawthorne trees were found along one side of a block of nursery trees of several acres in extent. The stock consisted of apple, pear, plum, cherry, and ornamental trees, but contained no peach trees. Half a mile away, in the same town, the proprietor had a block of 120,000 peach trees in which no scale could be found. Was he entitled to a certificate for his peach stock? Had the peach trees and the infested stock been owned by separate individuals the certificate would of course been granted for the peach trees.

In another case a nurseryman wanted his stock looked over to see whether or not it was infested with scale. No scale was found, but his peach stock was growing in a bearing orchard of peach trees badly infested with yellows. He had obtained and planted pits from the South where the yellows does not occur. Beneath and around some of the large trees the stock had produced that characteristic yellows growth, showing that within two years from the pit these young trees had not only contracted the disease from the old trees, but that during this time the malady had developed to such an extent that the characteristic growth had appeared. What should be done in this case? The inspection was made by request to know whether the stock was free from or infested with the San José scale. No scale was discovered, but something was there which would surely kill the trees as quickly, and for which no remedy is known. The form of certificate that we were giving did not specify yellows, but mentioned San José scale or other dangerously injurious insect or fungus pests. Yellows can hardly be classified with either, but is dangerously injurious to peach trees, nevertheless.

I made an inspection of a certain nursery a year ago in October and found no indications of the presence of the scale. This year during the same month another inspection was requested and made. On two pear trees which had been obtained under certificate from a southern nursery and planted out last spring were found less than a dozen individual scales that to all external appearances belonged to the species *Aspidiotus perniciosus*. It was only by accident that they were found at all, and would doubtless be overlooked in nine out of ten ordinary inspections. The owner's attention was called to the discovery and all other trees were subjected to a most thorough inspection to ascertain how far the insect had spread onto the other stock. Not a sign of scale was to be found except on these two trees, and one of them furnished but a solitary individual. In order to settle the question of identity beyond a doubt, specimens were taken to the laboratory and examined under

the compound microscope. Every scale that could be found was removed from the tree by cutting off a portion of bark upon which the insect was fastened. Upon reaching the laboratory the scales were examined and much to the writer's surprise not one was alive. A few were empty and there remained nothing but the external scaly covering. Under one of these shells remained about half of the insect—the anterior half—while the posterior half, which was the portion most needed, was gone and appeared to have been eaten away. Other coverings contained only portions of their inhabitants in a similar manner; and the entire lot did not contain a single anal extremity by which to determine accurately the species. What could be done? There were indications of the presence of the species, but the tangible proof was wanting.

Connecticut experience shows that wherever the scale is present in a nursery it is most apt to be found on the left-over stock and odds and ends that were not salable and were planted out in nursery rows. This kind of stock may have been grown at home, but usually it represents several different nurseries; and, having been planted out for a period varying from one to three seasons, the scale has time to develop to a sufficient extent, so that it is more noticeable than on young seedlings or budded stock that is making a rapid growth. In every case of infested nurseries in Connecticut the scale has been found upon this left-over stock. The largest and best-managed concerns have the smallest amount of this kind of stock. Many of these trees never amount to anything, and the writer is convinced that if the nurseryman would destroy two-thirds of them, and treat the best trees either by dipping in whale-oil-soap solution or by fumigating with hydrocyanic-acid gas before planting them in nursery rows, it would be much to his advantage as regards both safety and profit. He would be much less liable to have a badly infested nursery. As a rule, the writer makes it a point to examine this stock first of all in a nursery and to spend rather more time upon it proportionally than upon the other stock, especially if he has previously inspected the nursery.

There seems to be a tendency to give small nurseries a more rigid examination proportionally than large ones. I do not know how this is managed where laws exist. It seems to me that what we need is a uniform system of inspection and uniform legislation, if we have any. Apparently the only way to secure uniformity in the matter is to adopt national measures.

The subject was discussed by J. B. Smith, who said he considered the inspection of nursery stock a most unsatisfactory duty. His experience had been that the certificates of inspection were worthless, and he would be glad to see the system done away with and written guaranties of nurserymen substituted.

W. G. Johnson, of Maryland, gave an account of the success attending the inspection work and hydrocyanic-acid gas treatment in Maryland. His experience shows that it is impossible for a scale to survive the gas treatment when the latter is properly administered.

The subject was further discussed by S. M. Emery, L. C. Corbett, G. H. Powell, M. V. Slingerland, W. G. Johnson, and L. O. Howard. It was the general opinion that the inspection certificates are not reliable.

SECTION ON ENTOMOLOGY.

The Section on Entomology met in the rooms of the Division of Entomology of the United States Department of Agriculture at 2 p. m., November 15, with J. B. Smith in the chair. Mr. Smith explained that, as it was expected at the time the program was prepared the Association would meet in Omaha, most of the gentlemen whose names appeared were unable to be present.

A paper on "The relation of nature studies in the schools to the biology of the college curriculum" was read by C. M. Weed. The paper discussed briefly the historical development of the study of natural sciences in American schools and colleges, showing the advance during the last fifty years. Before 1890 but little was done in the lower grades, but since then nature studies have been rapidly introduced. Just now we are in a transition stage, having pupils who, for the most part,

have had no study of zoology or botany before reaching high school or college. In a few years we may hope to get those who have had nature studies, and the teaching of these subjects in college will enter upon a new phase—one in which much better results can be attained. It is legitimate work of the college, therefore, to foster and encourage the study of nature in the schools.

As noted above (p. 13), a joint session of the Section on Horticulture and Botany and the Section on Entomology was held November 16 to discuss the subject of nursery inspection.

SECTION ON MECHANIC ARTS.

The section was called to order in the Ebbitt House by the secretary, F. P. Anderson, at 2.30 p. m., November 15. The chairman and vice-chairman being absent, O. L. Waller was elected temporary chairman. The minutes of the section for the Minneapolis meeting were read and approved.

O. L. Waller, of Washington, read the first paper, entitled "What shall be the character of the preparatory work required to enter four-year engineering degree courses?" (See p. 75.)

This paper was discussed by M. H. Buckham, J. E. Stubbs, F. P. Anderson, E. A. Bryan, H. Gwinner, J. H. Washburn, and J. K. Patterson. Messrs. Buckham, Stubbs, and Bryan spoke of the difficulty of adjusting the college course to the high-school courses.

H. Gwinner thought that after the boy has passed through the grammar school the proper school to send him to is not the high school at all, but a school like the manual-training school. He comes out at 18. By that time he has had geometry, trigonometry, and other subjects leading directly to a course in engineering. That is the time for him to enter the college.

F. P. Anderson believed that we would make better engineers if we would give more attention to the so-called culture studies. The studies that we generally term the culture studies are the ones we believe give the men the best training. My experience has been that the men who come to us with a broad education of this kind develop into better engineers.

J. E. Stubbs said it was impossible in Nevada to secure the teaching of German and French in the preparatory schools on account of the inability of securing qualified teachers. It is considered there that the best language requirement under the circumstances is a three-year Latin course.

J. H. Washburn said that while the three-year course in Latin will round out and make more complete engineers, there are a large number of men who have no language sense, yet do excellently in mechanic arts. A man who lacks in language sense will do fairly well with German, very poorly with French, and hardly anything with Latin. The German seems to be more logical.

Mr. BUCKHAM. It depends practically upon the age of the student. There is a vast difference between a boy 14 years of age and one 24, particularly in the matter of languages. It very frequently happens that young men who aspire to an engineering course in this day do not fit themselves until they are men of 20 to 25 years of age, and at such a time it is difficult for any one to begin a foreign language. It is more difficult at 24 than at 14. I think that President Washburn's remark as to the difficulty of Latin is certainly an important one, if the candidate is a man. He may have a good mechanical sense, but we can not turn him back 10 years of his life to get him to the period when he might have done something with Latin. We have a good deal of difficulty with the preparatory training from this cause: There is an ambition on the part of the high school to bring in a little of a number of

sciences—a little physics, a little zoology, a little botany, a little chemistry, and so on—a half a year or a quarter of a year of each, in order that the programme may look attractive. A large number of students coming from such schools have never had thorough scientific training in one of these.

O. L. Waller argued that the study of Latin gave no especial preparation for the mechanical course, nor was it of particular value later in life, and that fully as good, if not better training, could be had from other subjects more directly in line with engineering work.

Mr. PATTERSON. We have, within the last three or four years, established a relationship with the high schools in Kentucky that promises to be of great advantage to us. We have a number of schools from which we receive, upon graduation, pupils without examination into the college, upon condition that they submit to us in advance their course of study, the amount of time devoted to it, and enable us to gauge as accurately as may be the thoroughness of their training. The high schools throughout the Commonwealth have manifested a desire to appear upon our catalogue as accredited high schools, and we receive those who take the honors in these high schools to our institution free of tuition. We give them all the advantages that are given. In the last two or three years the best pupils have come from these accredited high schools, and they are all anxious to put themselves within our line and to do what we want them to do in order to get these privileges. With us it has been productive of the very best results. Next to these, the best trained students come from the academy, which is organized in connection with the college and is a preparatory department for the college. There we have two courses of training, one the scientific agricultural and engineering, and another the classical and normal. I have the same opinion as Professor Anderson, that students should have some insight into classical studies before entering a technical course. The concurrent testimony is that there is a breadth of mind and an elasticity manifested by those who have had the classical training that is not displayed by others. If a man is versed in Latin it gives him a key to half the languages in Europe.

A paper, on "Engineering standards in land-grant colleges," by W. H. Williams, of Montana, was read by the secretary.

F. P. Anderson called attention to a new line of work being opened up at the Kentucky College with a view to developing the engineering course and creating interest on the part of students. This consisted of tests of the hauling power of locomotives, fuel-consumption tests, and other work for a railroad company. While the work was of such a character that the railroad authorities would not be required to have it done elsewhere, they were glad to avail themselves of the offer of the college, and appreciated the conclusions reached. The department received no compensation for the tests other than certain accommodations, as passes, to aid in carrying on the work. Two diagrams illustrating the work were exhibited and explained.

J. K. Patterson stated that the work done by the engineering department of the Kentucky College during the last year had saved the railroad company $150,000.

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